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ORIGINAL

FLOOD INSURANCE STUDY

CITY OF TULSA, OKLAHOMA

TULSA, OSAGE, AND ROGERS COUNTIES

FEBRUARY 5, 1986

Federal Emergency Management Agency

COMMUNITY NUMBER - 405381

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TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1

1.1 Purpose of Study 1

1.2 Authority and Acknowledgements 1

1.3 Coordination 1

2.0 AREA STUDIED 2

2.1 Scope of Study 2

2.2 Community Description 7

2.3 Principal Flood Problems 8

2.4 Flood Protection Measures 9

3.0 ENGINEERING METHODS 16

3.1 Hydrologic Analyses 17

3.2 Hydraulic Analyses 20

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS 22

4.1 Flood Boundaries 22

4.2 Floodways 22

5.0 INSURANCE APPLICATION 71

5.1 Reach Determinations 71

5.2 Flood Hazard Factors 71

5.3 Flood Insurance Zones 71

5.4 Flood Insurance Rate Map Description 92

TABLE OF CONTENTS - continued

Page

6.0 OTHER STUDIES 93

7.0 LOCATION OF DATA 94

8.0 BIBLIOGRAPHY AND REFERENCES 94

FIGURES

Figure 1 - Vicinity Map 3

Figure 2 - Watershed Map 6

Figure 3 - Flood Photograph 10

Figure 4 - Flood Photograph 11

Figure 5 - Flood Photograph 12

Figure 6 - Flood Photograph 12

Figure 7 - Flood Photograph 13

Figure 8 - Flood Photograph 13

Figure 9 - Flood Photograph 14

Figure 10 - Flood Photograph 15

Figure 11 - Floodway Schematic 23

TABLES

Table 1 - Streams Studied 2, 4-5

Table 2 - Summary of Discharges 18 - 20

Table 3 - Floodway Data 24 - 70

Table 4 - Flood Insurance Zone Data 72 - 91

TABLE OF CONTENTS - continued

EXHIBITS

Exhibit 1 - Flood Profiles

Watershed Unit 1

Arkansas River Panels 01P-04P

Watershed Unit 2

Bird Creek Panels 05P-08P

Watershed Unit 7

Bird Creek Tributary Panels 09P-10P
Coal Creek (North Tulsa) Panels 11P-13P
Coal Creek Tributary Panel 14P
Flat Rock Creek Panels 15P-17P
Flat Rock Creek Tributary A Panels 18P-19P
Dirty Butter Creek Panels 20P-21P
Dirty Butter Creek Tributary Panel 22P
Valley View Creek Panel 23P

Watershed Unit 8

Mingo Creek Panels 24P-27P
Douglas Creek Panels 28P-29P
Mill Creek Panels 30P-31P
Jones Creek Panel 32P
Audubon Creek Panel 33P
Bell Creek Panel 34P
Bell Creek Tributary Panels 35P-36P
Fulton Creek Panel 37P
Alsuma Creek Panels 38P-39P
Little Creek Panel 40P
Quarry Creek Panels 41P-42P
Eagle Creek Panels 43P-44P
Cooley Creek Panels 45P-46P
Cooley Creek Tributary Panels 47P-48P
Tupelo Creek Panels 49P-50P
Tupelo Creek Tributary Panel 51P
Brookhollow Creek Panels 52P-53P
Brookhollow Creek Tributary Panel 54P
Sugar Creek Panel 55P
Southpark Creek Panels 56P-57P
Ford Creek Panels 58P-59P
Catfish Creek Panel 60P

Watershed Unit 9

Spunky Creek Tributary A Panel 61P
Spunky Creek Tributary B Panel 62P
Spunky Creek Tributary B-1 Panel 63P

TABLE OF CONTENTS - continued

EXHIBITS - continued

Exhibit 1 - Flood Profiles
  Watershed Unit 10
    Harlow Creek — Panel 64P
    Harlow Creek Tributary — Panel 65P
    Blackboy Creek — Panel 66P
  Watershed Unit 11
    Vensel Creek — Panel 67P
    Fred Creek — Panels 68P-69P
    Joe Creek — Panel 70P
    South Fork Joe Creek — Panel 71P
    Little Joe Creek — Panels 72P-73P
    South Fork Little Joe Creek — Panel 74P
    North Fork Little Joe Creek — Panel 75P
    East Branch Joe Creek — Panel 76P
    West Branch Joe Creek — Panel 77P
    Crow Creek — Panel 78P
  Watershed Unit 12
    Hager Creek — Panels 79P-80P
    Mooser Creek — Panels 81P-83P
    Mooser Creek Tributary — Panel 84P
    Cherry Creek (West Tulsa) — Panels 85P-86P
    Red Fork Creek — Panel 87P
    Nickel Creek — Panel 88P
  Watershed Unit 13
    Haikey Creek — Panel 89P
    West Branch Haikey Creek — Panel 90P
    Little Haikey Creek — Panels 91P-93P
    Little Haikey Creek Tributary — Panel 94P
    Fry Ditch No. 2 — Panels 95P-96P
  Watershed Unit 11
    Vensel Creek Relocated — Panels 97P-98P
    Tributary No. 1 to Vensel Creek Relocated — Panel 99P

Exhibit 2 - Flood Boundary and Floodway Map Index
  Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY
CITY OF TULSA, OKLAHOMA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Tulsa, Tulsa, Osage, and Rogers Counties, Oklahoma, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in their efforts to promote sound flood plain management. Minimum flood plain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by the Tulsa District of the U. S. Army Corps of Engineers for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. IAA-H-7-76, Project Order No. 22 and Inter-Agency Agreement No. IAA-H-10-77, Project Order No. 2 and amendments thereto. This work was completed in September 1979. An updated hydraulic analysis for Little Haikey Creek Tributary was performed by Mansur, Daubert, Strella, Inc., under agreement with FEMA. The hydraulic analysis for Little Haikey Creek Tributary was completed in May 1983. A revised hydraulic analysis for Vensel Creek was also performed by Mansur, Daubert, Strella, Inc., for FEMA and was completed in August 1984.

1.3 Coordination

All levels of local, state, and federal government were contacted in a search for available information. The Tulsa Metropolitan Area Planning Commission (TMAPC) also supplied pertinent information. On August 5, 1976, the purpose of the study was discussed and streams to be studied were selected at an initial Consultation and Coordination Officer's (CCO) meeting attended by representatives of FEMA, the City of Tulsa, the TMACP, and the U. S. Army Corps of Engineers (COE - the study contractor). Other meetings were conducted during the course of the study to solicit information. An intermediate CCO meeting was held on January 10, 1980, to discuss the preliminary floodways with city officials. On June 19, 1981, the results of the study were reviewed at a final CCO meeting held with representatives of FEMA, the city, and the COE.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Tulsa, Tulsa, Osage, and Rogers Counties, Oklahoma. The area of study is shown on the Vicinity Map (Figure 1).

Detailed studies were performed on the Arkansas River, Bird Creek, and 16 other major stream systems in the Tulsa area. A total of 58 streams were studied that affect Tulsa. Table 1, "Streams Studied," lists those streams studied in this report. This study was prepared as part of a larger study entitled "Tulsa Metropolitan Area Flood Insurance Study", which covers Tulsa, 12 other communities, and Tulsa County. Hydraulic features of Little Haikey Creek Tributary have changed due to channel modifications and the construction of the South 77th Avenue bridge. These changes necessitated the revision of the floodway, base flood elevations, and profiles for Little Haikey Tributary. Vensel Creek upstream of 101st Street has been relocated to flow directly into the Arkansas River. This revision has created two new flooding sources which have been named Vensel Creek Relocated and Tributary No. 1 to Vensel Creek. In addition to the new streams, the floodway, base flood elevations, and profiles for Vensel Creek were changed. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction.

TABLE 1 - STREAMS STUDIED

Watershed Unit No.	Name of Stream
1	Arkansas River
2	Bird Creek

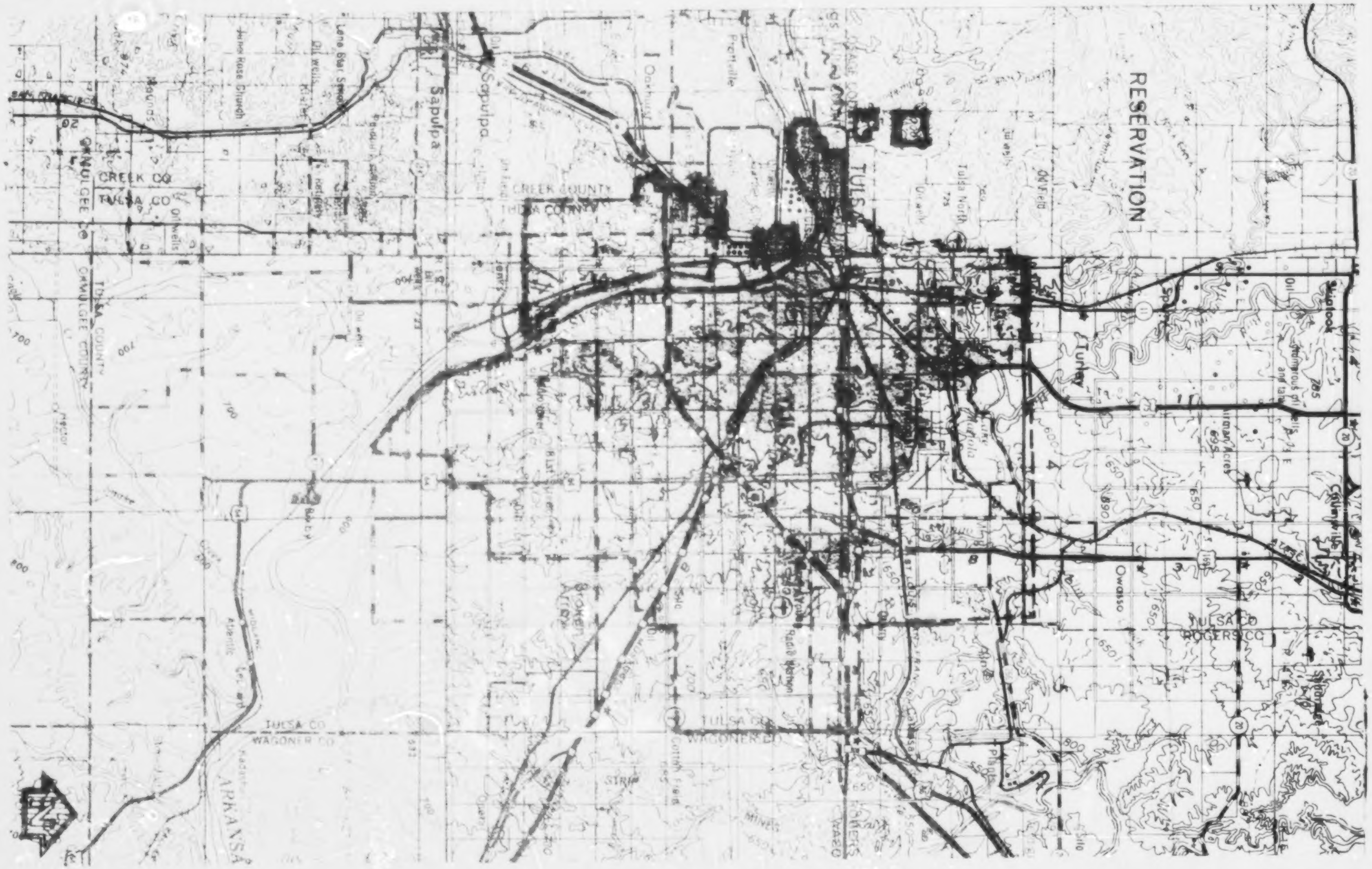
RESERVATION
Sapulpa
CREEK CO
TULSA CO
CREEK COUNTY
TULSA COUNTY
OKMULGEE CO
TULSA COUNTY
OKMULGEE COUNTY
TULSA
Turley
Owasso
Broken Arrow
Bixby
Jenks
Collinsville
TULSA CO
ROGERS CO
TULSA CO
WAGONER CO
TULSA CO
WAGONER CO
ARKANSAS
STRIP
MINES
Sperry
Catoosa

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

TABLE 1 - STREAMS STUDIED - continued

Watershed Unit No.	Name of Stream
7	Bird Creek Tributary
	Coal Creek (North Tulsa)
	Coal Creek Tributary
	Flat Rock Creek
	Flat Rock Tributary A
	Dirty Butter Creek
	Dirty Butter Creek Tributary
	Valley View Creek
8	Mingo Creek
	Douglas Creek
	Mill Creek
	Jones Creek
	Audubon Creek
	Bell Creek
	Bell Creek Tributary
	Fulton Creek
	Alsuma Creek
	Little Creek
	Quarry Creek
	Eagle Creek
	Cooley Creek
	Cooley Creek Tributary
	Tupelo Creek
	Tupelo Creek Tributary
	Brookhollow Creek
	Brookhollow Creek Tributary
	Sugar Creek
	Southpark Creek
	Ford Creek
	Catfish Creek
9	Spunky Creek Tributary A
	Spunky Creek Tributary B
	Spunky Creek Tributary B-1
10	Harlow Creek
	Harlow Creek Tributary
	Blackboy Creek

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TABLE 1 - STREAMS STUDIED - continued

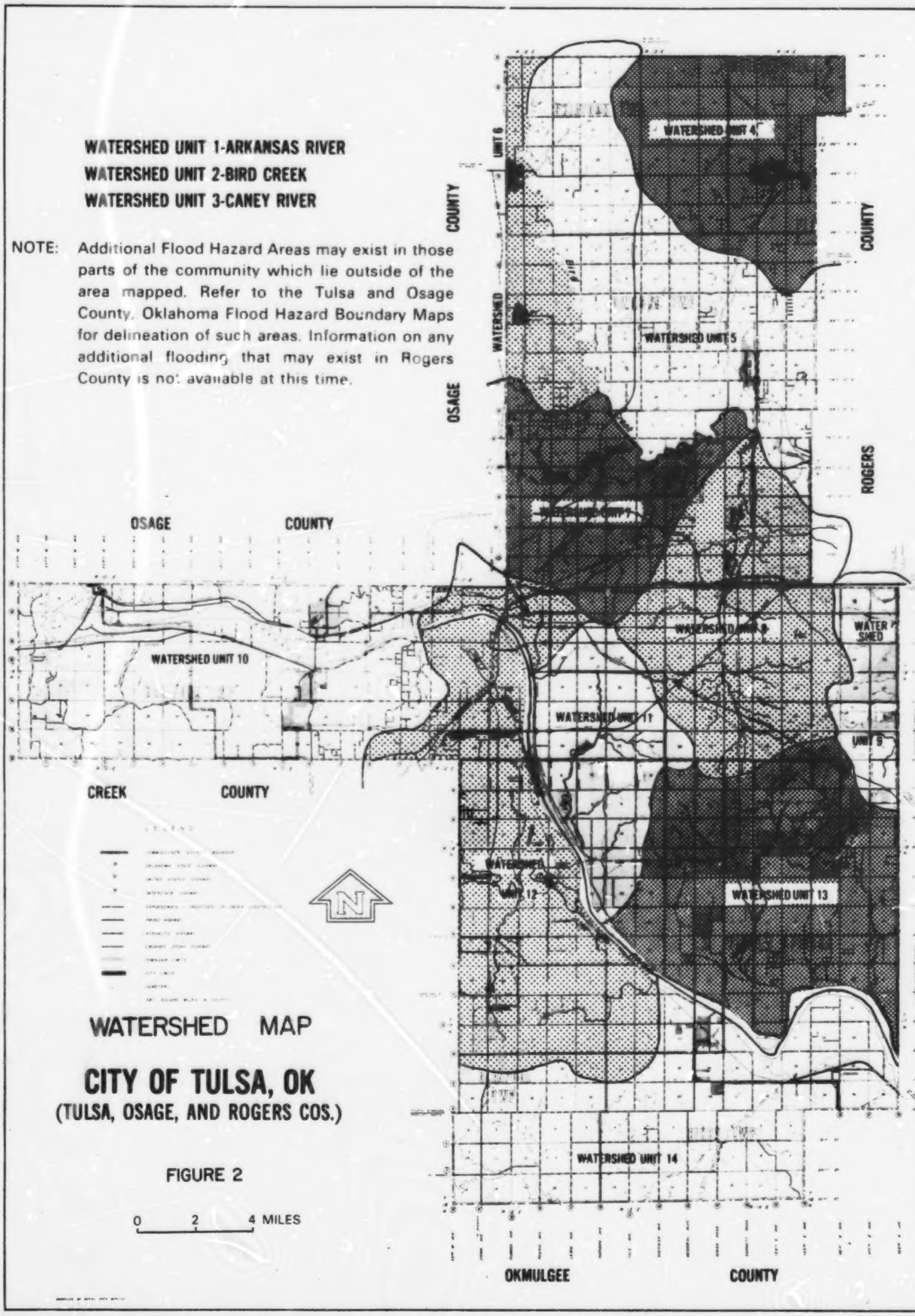
Watershed Unit No.	Name of Stream
11	Vensel Creek Fred Creek Joe Creek South Fork Joe Creek Little Joe Creek South Fork Little Joe Creek North Fork Little Joe Creek East Branch Joe Creek West Branch Joe Creek Crow Creek
12	Hager Creek Mooser Creek Mooser Creek Tributary Cherry Creek (West Tulsa) Red Fork Creek Nickel Creek
13	Haikey Creek West Branch Haikey Creek Little Haikey Creek Little Haikey Creek Tributary Fry Ditch No. 2
11	Vensel Creek Relocated Tributary No. 1 to Vensel Creek Relocated

The study procedure described below was used to facilitate the management, filing, and retrieval of the large amount of data produced during the study. This procedure will also insure compatibility of data provided to adjoining communities (or Tulsa County) and will simplify future alterations due to changes in city boundaries.

Topographic maps at a scale of 1:2,400 (reduced to a scale of 1:7,200) with a contour interval of 2 feet were prepared for the City of Tulsa (Reference 1). Hydrologic and hydraulic data were developed for individual watersheds. The watersheds were defined as shown in Figure 2 to facilitate the development of hydrologic and hydraulic data using a systematic approach. Each work map panel for Tulsa includes data

WATERSHED UNIT 1-ARKANSAS RIVER
WATERSHED UNIT 2-BIRD CREEK
WATERSHED UNIT 3-CANEY RIVER

NOTE: Additional Flood Hazard Areas may exist in those parts of the community which lie outside of the area mapped. Refer to the Tulsa and Osage County, Oklahoma Flood Hazard Boundary Maps for delineation of such areas. Information on any additional flooding that may exist in Rogers County is not available at this time.


WATERSHED UNIT 4
UNIT 6
WATERSHED
WATERSHED UNIT 5
OSAGE COUNTY
ROGERS COUNTY
OSAGE COUNTY
WATERSHED UNIT 10
WATERSHED UNIT 8
WATER SHED
WATERSHED UNIT 11
UNIT 9
WAGONER COUNTY
CREEK COUNTY
WATERSHED UNIT 12
WATERSHED UNIT 13
WATERSHED UNIT 14
OKMULGEE COUNTY
N
0 2 4 MILES

WATERSHED MAP

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

FIGURE 2

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developed for each stream on that panel. Floodway Data Tables, Flood Insurance Zone Tables, and profiles were developed for the total length of each stream studied. Since the tables included in this study related only to Tulsa, the first letter designation for a cross section for any particular stream may or may not begin with the letter "A".

The upper portion of Cherry Creek was studied by approximate methods. In addition, an unnamed tributary to Vensel Creek relocated downstream of 91st Street was studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the City of Tulsa.

2.2 Community Description

The City of Tulsa, which is the second largest city in Oklahoma, is located in Tulsa, Osage, and Rogers Counties in northeastern Oklahoma. Tulsa lies approximately 90 miles northeast of the City of Oklahoma City. Nearby communities include Broken Arrow, Sand Springs, and Bixby. The 1978 population of Tulsa was estimated at approximately 357,000.

The general study area was originally part of Indian Territory, which was composed of the territories west of the Mississippi River and included in the Louisiana Purchase. The first settlers to arrive in the study area were the Creek Indians, who were relocated from their land allocations in the southern states by directives from Congress in the early part of the nineteenth century.

Land runs were opened in 1889, 1891, and 1893 and attracted large numbers of settlers. In 1897, oil was discovered at Bartlesville, 60 miles north of Tulsa, and the whole nature of the region changed with the influx of speculators, drillers, and wildcatters. Oil was discovered in west Tulsa in 1901. The discovery attracted investors from the east, and Tulsa became the main center of oil concern. The Glenn Pool discovery, located approximately 15 miles southwest of Tulsa, came in 1905 and is still considered by geologists to be the richest small oil field in the world. After two years of development, there were 500 wells furnishing the oil that our developing economy needed. It was at that time Tulsa was named the "Oil Capital of the World." The three major facets of the industrial base are manufacturing, petroleum, and aerospace, but the Arkansas River Basin Navigation System has opened up new possibilities for industrial growth.

The terrain in the Tulsa area is mostly gently rolling hills, with a small amount of flat land located in the Arkansas River flood plain. Vegetation includes native prairie grasses (big and little bluestem, switch grass, and side-oats grama) and introduced species such as Bermuda grass and Fescue. Trees of the area include juniper, cedar, spruce, elm, blackjack, and varieties of oak.

The weather is generally temperate in Tulsa with mild winters and occasional snow. The average annual precipitation is approximately 37 inches. The average annual temperature is 61 degrees Fahrenheit (°F) with a mean high of 82°F and a mean low of 38°F.

The drainage pattern of Tulsa is dominated by the Arkansas River and its tributaries and Bird Creek and its tributaries. Watershed Units 10, 11, and 13 drain south into the Arkansas River, and Unit 12 drains east to the river. Watershed Units 7 and 8 drain east and north, respectively, into Bird Creek.

The major pattern of development is to the southeast. Large areas of Tulsa lie within the existing 100-year flood plain, with the largest flood plain development located in the Mingo Creek watershed (Watershed Unit 8).

2.3 Principal Flood Problems

The majority of severe floods in the Tulsa area is caused by intense rainfall resulting from local thunderstorms. The amount of flooding is generally increased in the areas where natural and manmade obstructions in the flood plain impede large flows. Manmade obstructions include bridges, culverts, earthfills, and building developments. Natural obstructions include dense vegetation, constrictions in the flood plain topography, and meandering channels.

Several major floods have occurred in the Tulsa area. Major flooding on the Arkansas River occurred in 1908, 1923, 1957, and 1959. A water stage recorder gage is located on the river at the 11th Street bridge. The flood peak of record at the gage occurred on October 5, 1959, with a peak flow estimated at 246,000 cubic feet per second (cfs). The recurrence interval of the flood at the gage (for non-regulated conditions) was approximately 25 years.

Numerous floods have occurred in the Bird Creek basin. The flood of October 3, 1959, is the largest flood of record at the Sperry gage (8th Street North) with a peak discharge of 90,000 cfs, which is estimated to be the 100-year event under natural conditions. Severe floods also occurred in 1943, and two floods occurred in 1974. Various amounts of overbank flooding has occurred approximately every 6 to 7 years.

Floods have also occurred on the other streams studied by detailed methods. The two most severe floods on Haikey Creek and its tributaries occurred on June 8, 1974, and May 30, 1976. The June 1974 flood was the most severe on the lower end of the watershed. The May 1976 flood had a recurrence interval of approximately 10 to 20 years.

The Mingo Creek watershed also experienced severe flooding in June 1974 and May 1976. The May 1976 flood was the flood of record for Mingo Creek. Two recurrence intervals were estimated for the flood; from 10 years in the lower basin to 100 years in the upper areas.

Major flooding has also occurred along Joe, Flat Rock, Dirty Butter, and Cherry Creeks. The June 1974 and May 1976 floods were the most severe on Joe Creek, while the June 22, 1979, flood was the most severe on Dirty Butter Creek. The flood of record for Flat Rock Creek occurred on July 15, 1961. The recurrence interval of the May 1976 flood on Joe Creek was estimated at approximately 50 years.

Figures 3 through 10 show historic flood scenes in the Tulsa area.

2.4 Flood Protection Measures

Major flood control projects on the Arkansas River above Tulsa include Keystone Lake, Kaw Lake, and John Martin Reservoir. Several small dams are located on tributaries of the Arkansas River, but Keystone Lake and Kaw Lake are the only projects considered to have significant effects on the Arkansas River flows at Tulsa. Keystone Lake was completed in September 1964, and Kaw Lake was completed in April 1976. The Keystone Lake and Kaw Lake projects reduce the natural 100-year flood on the Arkansas River from 360,000 cfs to approximately 170,000 cfs at the gage located on the 11th Street bridge.

Local flood protection projects have been built on Flat Rock, Valley View, Mingo, Cherry, and Red Fork Creeks. The Flat Rock Creek project (built by the COE) consists of approximately 1.2 miles of channel modification on Flat Rock Creek from Peoria Avenue to Cincinnati Avenue. Also, approximately 0.8 mile of channel on Valley View Creek was modified. The Flat Rock Creek project provides protection for the 50-year flood.

Several portions of the Mingo Creek channel have been straightened and widened to reduce flooding along the creek. The modifications were made by land developers and by the city, and they provide protection against the 50-year flood for various areas.

FIGURE 3: View looking south at Arkansas River near Frisco and 11th Street bridges during flood of June 13, 1923.

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FIGURE 4: View looking west across Arkansas River near Old Midland Valley Railroad bridge during flood of October 5, 1959.

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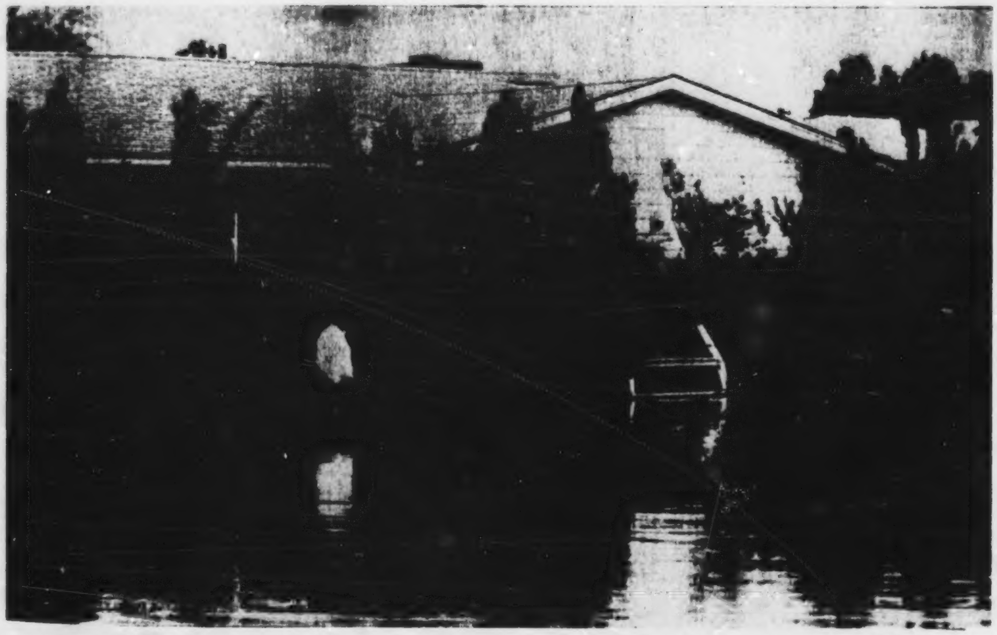

FIGURE 5: View of flood waters near 9500 block of East 8th Street along Mingo Creek during June 1968 flood.

FIGURE 6: View of flood waters along Mingo Creek during June 1968 flood.

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FIGURE 7: View near intersection of 7th Street and Mingo Road during flood of May 30, 1976.

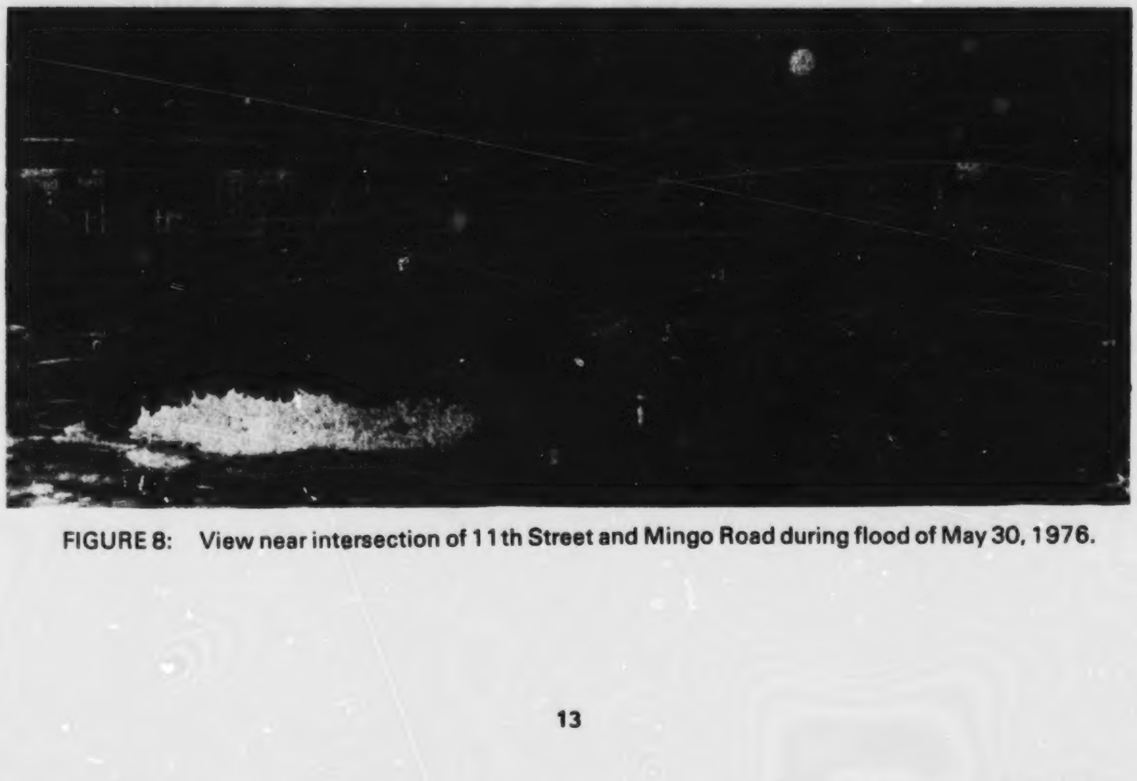

FIGURE 8: View near intersection of 11th Street and Mingo Road during flood of May 30, 1976.

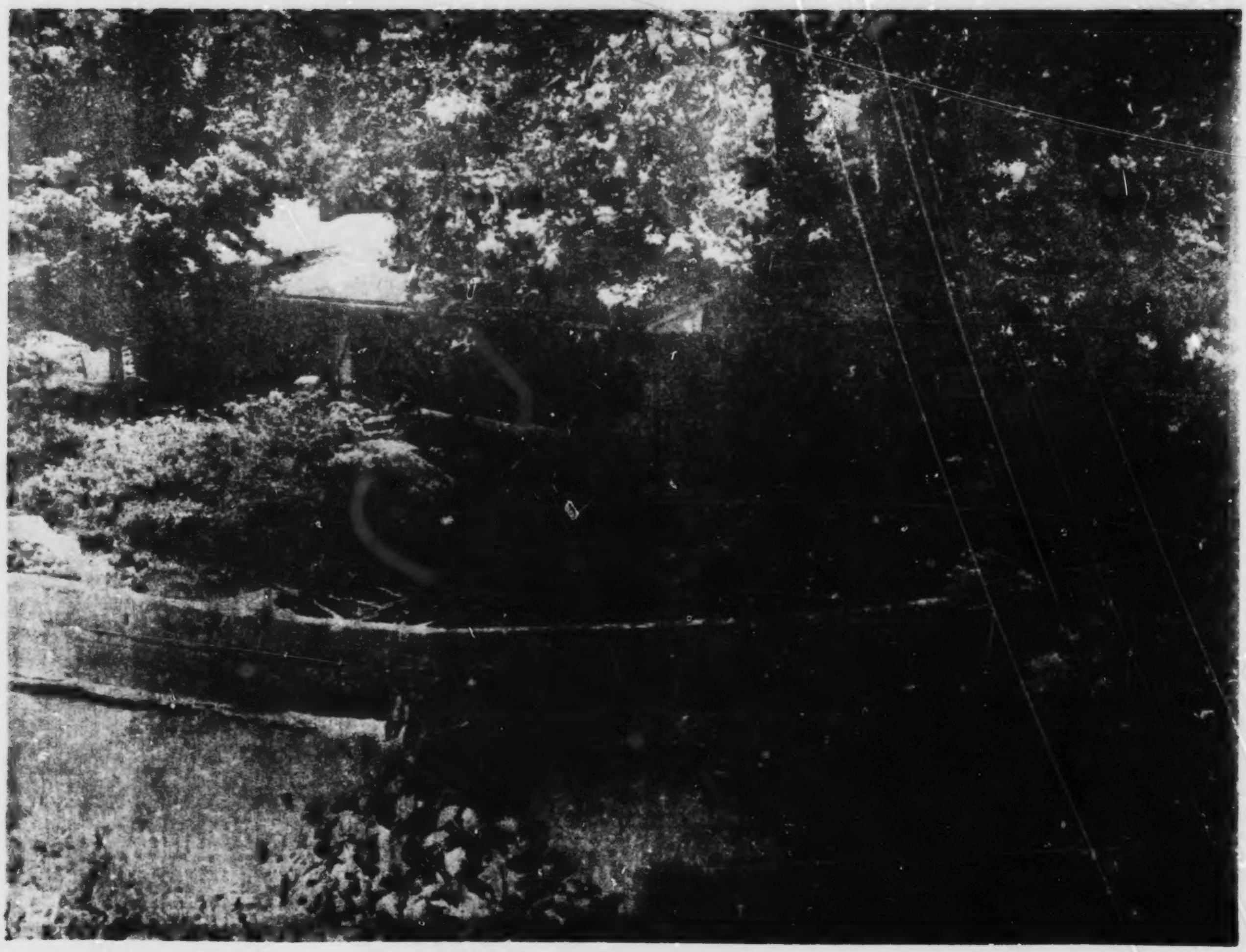

FIGURE 9: Flood waters of May 1976 demolished this house at Sandusky Avenue and Little Joe Creek.

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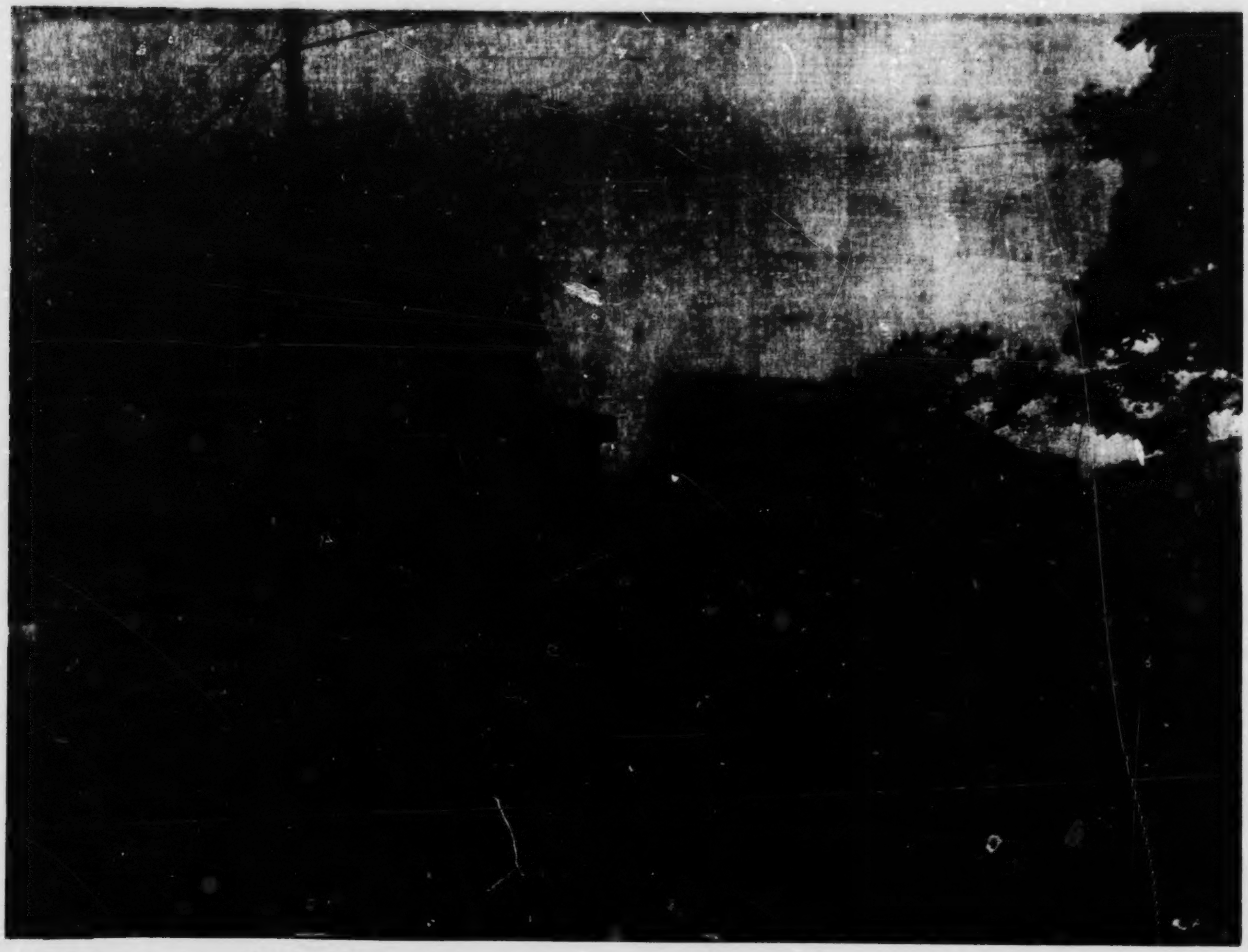

FIGURE 10: The Flamingo Trailer Park near Pine Street and Mingo Creek was hard hit by floodwaters of May 1976.

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The Cherry Creek flood protection project, which was constructed by the COE in November 1969, consists of 5,300 feet of channel modification along Cherry Creek and approximately 1,300 feet of channel modification along Red Fork Creek. Studies have shown that the project provides protection against a 10-year to 50-year flood, depending on the location along the creek.

Joe Creek has been channelized and straightened from its confluence with the Arkansas River to a point near East 66th Street. The channel modification was performed by local land developers and will contain a flood having a recurrence interval of approximately 100 years. Additional channelization is being done by the COE along Joe Creek from East 66th Street upstream to 51st Street. The modified channel will carry the 100-year flood.

The Bird Creek basin has three major flood control projects that affect flows at Tulsa, including Skiatook Lake, Birch Lake, and Candy Lake. Birch Lake was completed in March 1977; closure on Skiatook Lake and Candy Lake was tentatively scheduled for October 1982 and June 1982, respectively, depending on congressional funding and contract scheduling. The three projects on Bird Creek will reduce the 100-year flood at the Sperry gage (located at the 86th Street North bridge) from approximately 90,000 cfs to approximately 43,000 cfs. The effects of this flow reduction will diminish downstream because of the intervening uncontrolled area.

In addition to the structural measures mentioned above, several small agricultural levees are located in the study area. These levees were assumed to remain in place during flooding conditions. Tulsa also employs various non-structural measures to reduce flood damage and prevent future losses. These include flood zoning ordinances, subdivision regulations, building permits, and flash flood warnings.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

Natural flood-flow frequencies for the Arkansas River were based on a statistical analysis of peak flows at the Tulsa gage (located on the 11th Street bridge) for the period from October 1904 through September 1964. Keystone Lake inflows were used from September 1964 through September 1975. Methods outlined in Water Resources Council Bulletin 17 were used in developing the natural frequency curve without regulation by Keystone Lake and Kaw Lake (Reference 2). Hypothetical flows were developed for regulated conditions for the period from 1940 to 1976 using a reservoir system simulation model. These flows were used to derive a frequency curve for modified conditions showing the effects of Keystone Lake and Kaw Lake.

Natural flood-flow frequencies for Bird Creek at Sperry were based on a statistical analysis of peak flows at the Sperry gage for the period from 1939 through 1976. The modified flows used in the study were then developed by modeling design storms with and without regulation for the Sperry gaging station and downstream locations.

For flood flows on the remaining streams studied by detailed methods, the drainage areas were appropriately subdivided, and synthetic unit hydrographs were determined for each sub-area using the Snyder method. The unit hydrograph coefficients were adjusted for urbanization. Rainfall data for the floods of the selected recurrence intervals were obtained from Technical Paper No. 40, and the estimated rainfall excesses were applied to the unit graphs to obtain the runoff (Reference 3). The rainfall data from Technical Paper No. 40 were adjusted to make the resulting curve consistent with curves developed in a regional frequency study. Runoff from the individual sub-areas was then routed by the storage-discharge method and combined to determine peak flows at points along the stream. The unit hydrographs were adjusted to reflect the effects of development presently existing in the watershed.

A summary of drainage area-peak discharge relationships is shown in Table 2, "Summary of Discharges."

TABLE 2 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs)			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
ARKANSAS RIVER[1]					
At the lower limit of study	23,090[2]	90,000	105,000	170,000	480,000
At Keystone Lake	22,350[2]	90,000	105,000	170,000	480,000
BIRD CREEK					
At the lower limit of study[3]	1,125	25,000	43,500	52,500	77,000
At Sperry, Oklahoma[3]	905	21,000	35,500	43,000	62,500
COAL CREEK					
At the mouth	9.5	2,940	5,610	7,100	11,100
FLAT ROCK CREEK					
At the mouth	35.5	8,900	18,700	23,800	37,300
At North Peoria Avenue	11.7	6,420	12,500	15,200	23,900
DIRTY BUTTER CREEK					
At the mouth	8.6	5,090	8,790	10,800	17,000
MINGO CREEK					
At the mouth	61.1	15,550	30,200	34,900	56,050
At the 11th Street bridge	25.6	9,600	18,100	22,300	33,450
SPUNKY CREEK					
At the lower limit of study	3.8	2,060	3,560	4,160	7,180
HARLOW CREEK					
At the mouth	6.9	2,930	5,670	6,000	6,000[4]
At the Tulsa-Osage County boundary	4.0	1,940	3,690	4,600	7,090

[1] Modified by Keystone, Kaw, Great Salt Plains, and Cheney Reservoirs

[2] Drainage area contributing to peak; total drainage is 74,506 square miles

[3] Peak discharges reflect conditions modified by Birch, Candy, and Skiatook Lakes

[4] Discharge in excess of 6,000 cfs is lost from basin

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TABLE 2 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
VENSEL CREEK					
At the mouth	4.7	1,650	2,280	2,560	2,710
FRED CREEK					
At the mouth	3.7	2,660	4,850	5,620	7,320
JOE CREEK					
At the mouth	13.1	6,100	11,500	14,000	21,500
At the confluence of South Fork Joe Creek	10.8	5,340	10,030	12,215	18,800
LITTLE JOE CREEK					
At the mouth	4.3	3,532	6,175	7,352	10,847
CROW CREEK					
At the mouth	2.6	2,090	3,730	4,520	6,830
HAGER CREEK					
At the mouth	2.6	750	1,170	1,420	2,240
MOOSER CREEK					
At the mouth	5.1	2,690	3,730	4,520	6,830
CHERRY CREEK					
At the mouth	6.2	3,000	5,300	6,000	7,800
Above the confluence of Red Fork Creek	2.7	800	1,300	1,600	2,200
RED FORK CREEK					
At the mouth	2.9	2,100	3,600	4,500	6,900
NICKEL CREEK					
At the mouth	13.3	3,300	6,500	8,300	13,400
WEST BRANCH HAIKEY CREEK					
At the mouth	1.6	1,700	3,300	4,100	6,300
LITTLE HAIKEY CREEK					
At the mouth	6.4	2,200	5,200	6,600	11,300
At East 91st Street	3.4	2,200	4,400	5,500	9,400

TABLE 2 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs)			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
FRY DITCH NO. 2					
At cross section BI	5.2	3,610	4,830	5,430	6,650
VENSEL CREEK RELOCATED					
At its confluence with the Arkansas River	2.3	4,300	5,630	6,330	7,940
TRIBUTARY NO. 1 TO VENSEL CREEK RELOCATED					
At its confluence with Vensel Creek Relocated	1.1	1,070	1,410	1,580	1,970

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections of each of the stream channels and valleys studied by detailed methods were obtained by field surveys and aerial photogrammetry. These sections were supplemented by data taken from topographic maps at a scale of 1:2,400 with a contour interval of 2 feet (Reference 1). Bridge and road plans were used for some cross sections (Reference 4); other bridge cross sections and bridge geometry were field measured. The hydraulic features of Little Haikey Creek Tributary have changed due to channel modifications and the construction of the South 77th Avenue bridge. Updated cross sections of the revised channel area were field surveyed. These sections were supplemented by data taken from topographic maps at a scale of 1:600 with a contour interval of 1 foot (Reference 5). Bridge geometry was field measured.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Roughness coefficients (Manning's "n") used in the hydraulic computations were based on field reconnaissance and typical photographs of the area. The various roughness coefficients used for the streams studied by detailed methods are listed in the following tabulation. High-water marks for recent floods were used to verify "n" values for some of the streams.

Flooding Source	Channel "n"	Overbank "n"
Arkansas River	0.025-0.033	0.040-0.150
Bird Creek	0.045-0.070	0.030-0.110
Flat Rock Creek and tributaries	0.035-0.080	0.040-0.200
Dirty Butter Creek and tributaries	0.040-0.100	0.035-0.180
Coal Creek	0.020-0.080	0.040-0.080
Mingo Creek and tributaries	0.015-0.150	0.040-0.150
Spunky Creek tributaries	0.040-0.060	0.040-0.100
Harlow Creek	0.040	0.040-0.060
Joe Creek and tributaries	0.030-0.250	0.035-0.250
Fred Creek	0.040-0.080	0.050-0.150
Vensel Creek	0.030-0.065	0.017-0.050
Hager Creek	0.045-0.100	0.050-0.100
Mooser Creek	0.060-0.070	0.060-0.150
Cherry Creek	0.045-0.060	0.060-0.120
Nickel Creek	0.070	0.080-0.120
Little Haikey Creek	0.020-0.125	0.035-0.090
Fry Ditch No. 2	0.030-0.070	0.040-0.080
Vensel Creek Relocated	0.016-0.065	0.040-0.050
Tributary No. 1 to Vensel Creek Relocated	0.015-0.035	0.015-0.035

Water-surface elevations of floods of the selected recurrence intervals were computed using the COE HEC-2 step-backwater computer program (Reference 6). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

Starting water-surface elevations for the Arkansas River, Bird Creek, and their tributaries were determined by normal depth calculations. Starting water-surface elevations for the remaining streams studied by detailed methods were based on coincident flooding occurring on the stream into which the tributaries flow.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study produces maps designed to assist communities in developing flood plain management measures.

4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year flood plain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps (References 1 and 5).

For the streams studied by approximate methods, the 100-year flood boundary was delineated using the 2-foot contour topographic maps and the best information available (Reference 1).

The 100- and 500-year flood plain boundaries are shown on the Flood Boundary and Floodway Map (Exhibit 2). In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

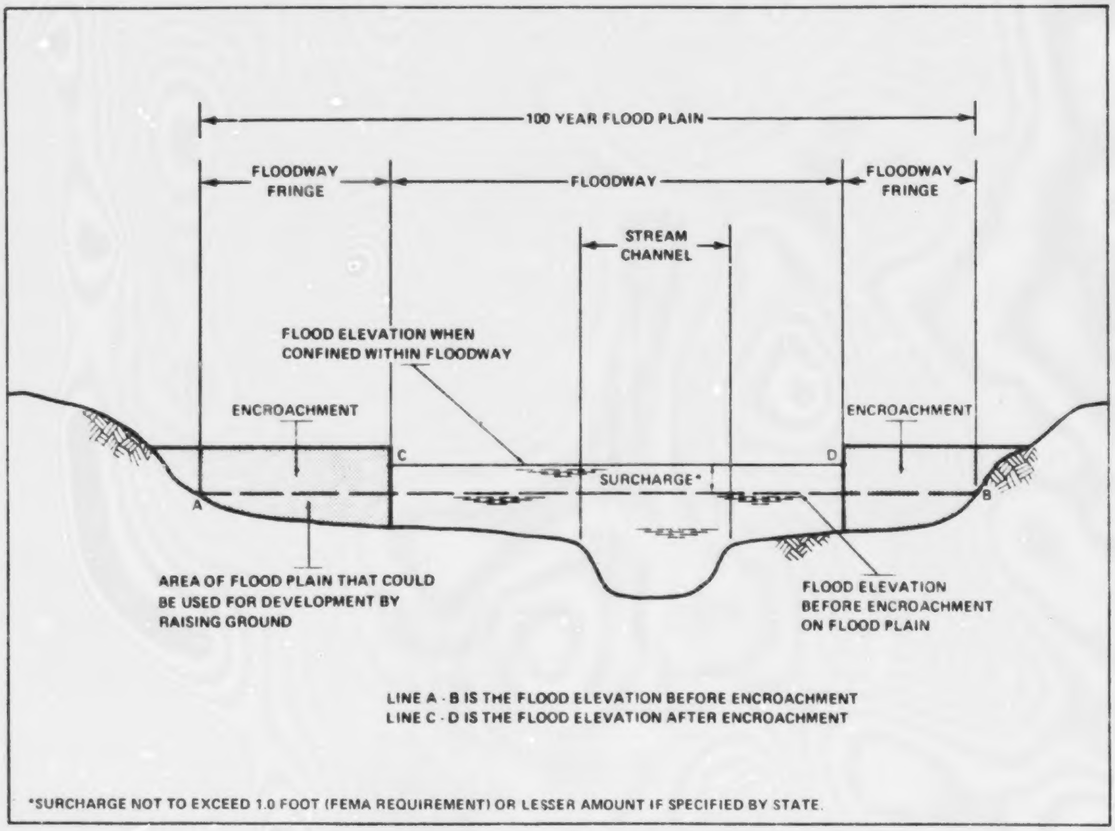
4.2 Floodways

Encroachment on flood plains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood plain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (Table 3).

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were computed at cross sections. Between cross sections, the boundaries were interpolated. In cases where the floodway and 100-year flood plain boundaries are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and 100-year flood plain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain developments are shown in Figure 11.


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC Figure 11

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 1 Arkansas River								
Z*	73,181	1717	26,596	6.4	605.8	605.8	605.9	0.1
AA	79,200	2497/300[2]	34,889	4.9	608.3	608.3	608.5	0.2
AB	82,368	2073/50[2]	36,908	4.6	609.1	609.1	609.2	0.1
AC	86,592	1770/80[2]	25,034	6.8	610.3	610.3	610.4	0.1
AD	89,760	1920/100[2]	29,976	5.7	611.9	611.9	611.9	0.0
AE*	92,928	2320	31,376	5.4	613.0	613.0	613.0	0.0
AF*	98,102	1400	28,343	6.2	615.0	615.0	615.0	0.0
AG	103,858	1820	34,038	5.4	617.3	617.3	617.3	0.0
AH	107,395	2330	40,787	4.3	618.3	618.3	618.3	0.0
AI	111,936	1980	28,169	6.0	619.2	619.2	619.2	0.0
AJ	116,688	1300	24,287	7.0	621.1	621.1	621.1	0.0
AK	124,872	2120	31,277	5.4	625.7	625.7	625.7	0.0
AL	130,416	1520	27,263	6.4	627.3	627.3	627.3	0.0
AM	134,482	1760/1660[2]	36,293	4.7	628.9	628.9	628.9	0.0
AN	136,013	1370	21,004	8.1	629.2	629.2	629.2	0.0
AO	141,768	1250	19,005	8.9	632.2	632.2	632.2	0.0
AP	145,886	1310	22,450	7.6	634.5	634.5	634.5	0.0
AQ*	151,114	1130	26,690	6.5	636.9	636.9	636.9	0.0
AR*	157,450	2050	27,544	6.3	639.6	639.6	639.6	0.0

[1] Feet above River Mile 496.2

[2] Total width/width within corporate limits

*Outside corporate limits

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

ARKANSAS RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Watershed Unit No. 2 Bird Creek								
A	47,330	2570	20,186	2.6	583.5	583.5	584.5	1.0
B	50,160	763	11,893	4.4	584.8	584.8	585.7	0.9
C*	54,827	1307	19,510	2.8	586.5	586.5	587.5	1.0
D*	58,080	2299	27,903	1.9	587.6	587.6	588.5	0.9
E*	62,251	2949	29,476	1.5	588.6	588.6	589.5	0.9
F*	64,078	4838	25,403	1.9	589.2	589.2	590.1	0.9
G*	68,640	3292	29,927	1.4	590.0	590.0	590.9	0.9
H*	70,039	3396	15,031	2.8	590.4	590.4	591.3	0.9
I*	73,255	4720	52,592	0.8	590.9	590.9	591.9	1.0
J	80,098	9481/1450[2]	80,217	0.6	591.0	591.0	592.0	1.0
K	87,278	9977/4980[2]	72,905	0.7	591.5	591.5	592.5	1.0
L	92,030	9700/6460[2]	72,689	0.7	591.7	591.7	592.7	1.0
M	97,680	8408/6800[2]	38,214	1.4	592.9	592.9	593.9	1.0
N	101,429	5413/5210[2]	30,528	1.8	597.0	597.0	597.9	0.9
O	105,178	4826/3960[2]	32,512	1.7	598.5	598.5	599.4	0.9
P*	106,693	4250	26,410	1.9	599.6	599.6	600.6	1.0
Q*	109,296	2448	12,459	4.0	601.1	601.1	602.1	1.0
R*	111,656	2781	25,865	1.9	603.7	603.7	604.7	1.0
S*	114,032	2501	14,917	3.3	605.9	605.9	606.7	0.8

[1] Feet above Verdigris River.
[2] Total width/width within corporate limits.
*Outside corporate limits.

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

BIRD CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 7 Bird Creek Tributary								
A	1,300	176	683	2.1	594.5	592.8[2]	593.8[2]	1.0
B	2,900	150	323	4.4	600.6	600.6	601.4	0.8
C	4,150	175	702	2.0	603.5	603.5	604.4	0.9
D	5,230	111	370	3.8	606.5	606.5	606.9	0.4
E	6,050	100	384	3.7	609.7	609.7	610.5	0.8
Coal Creek (North Tulsa)								
A	2,860	1500	3,400	2.1	594.2	593.0[2]	594.0[2]	1.0
B	4,085	1504	4,055	1.8	594.2	593.6[2]	594.5[2]	0.9
C	7,075	1000	3,296	2.2	595.1	595.1	595.8	0.7
D	8,975	600	1,735	4.0	597.6	597.6	598.5	0.9
E	9,472	200	1,010	6.9	599.7	599.7	600.0	0.3
F	9,717	200	2,046	3.4	602.7	602.7	603.4	0.7
G	10,352	200	1,528	4.6	603.4	603.4	604.3	0.9
H	11,072	210	1,337	5.2	605.2	605.2	605.7	0.5
I	12,122	275	2,100	3.2	607.2	607.2	607.8	0.6
J	12,697	300	1,831	3.7	608.0	608.0	609.0	1.0
K	13,307	200	1,152	5.8	610.5	610.5	611.1	0.6

[1] Feet above Mohawk Park Pond for Bird Creek Tributary; Feet above mouth for Coal Creek (North Tulsa)

[2] Water-surface elevation computed without consideration of backwater effects

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

BIRD CREEK TRIBUTARY-COAL CREEK (NORTH TULSA)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Watershed Unit 7 Coal Creek (North Tulsa) cont.								
L	14,117	150	1,098	6.1	613.5	613.5	613.9	0.4
M	14,952	125	1,343	5.0	616.1	616.1	616.5	0.4
N	15,777	168	1,178	5.7	618.1	618.1	618.5	0.4
O	16,679	212	2,070	3.3	621.4	621.4	621.9	0.5
P	17,319	295	1,738	3.9	622.1	622.1	622.6	0.5
Q	19,224	150	1,125	5.5	626.2	626.2	627.0	0.8
R	20,124	315	1,965	3.1	628.9	628.9	629.7	0.8
S	20,804	90	667	7.5	629.6	629.6	630.3	0.7
T	21,454	150	637	7.8	634.6	634.6	635.3	0.7
U	22,104	83	643	7.8	638.1	638.1	638.6	0.5
V	23,197	173	1,097	4.6	643.1	643.1	643.9	0.8
W	24,251	105	711	7.0	649.9	649.9	650.0	0.1
X	24,409	100	918	5.4	652.4	652.4	652.4	0.0
Y	25,884	105	1,009	5.0	655.6	655.6	656.0	0.4
Z	26,167	79	719	7.0	656.5	656.5	657.1	0.6
AA	27,417	104	937	5.3	661.0	661.0	661.5	0.5
AB	27,601	50	544	9.2	661.8	661.8	662.3	0.5
AC	28,781	92	517	9.6	663.7	663.7	663.9	0.2
AD	30,156	57	228	11.5	671.0	671.0	671.0	0.0
AE	31,846	23	120	13.0	684.3	684.3	684.3	0.0

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

COAL CREEK(NORTH TULSA)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 7 Coal Creek Tributary								
A	640	52	287	8.5	665.4	665.4	666.4	1.0
B	1,080	46	304	8.0	669.9	669.9	670.0	0.1
C	1,375	95	462	2.9	673.4	673.4	673.9	0.5
D	1,825	58	307	4.4	676.0	676.0	676.0	0.0
E	2,475	31	184	7.3	680.4	680.4	680.8	0.4
Flat Rock Creek								
A	3,000	1500	5,560	4.3	598.7	598.7	599.7	1.0
B	3,950	1415	10,720	2.2	599.7	599.7	600.7	1.0
C	4,900	1125	7,234	3.3	600.1	600.1	601.1	1.0
D	6,225	500	5,401	4.4	601.0	601.0	602.0	1.0
E	7,110	300	3,227	7.0	604.3	604.3	604.3	0.0
F	8,660	885	7,905	3.0	606.4	606.4	607.4	1.0
G	9,735	874	7,337	3.2	607.0	607.0	607.9	0.9

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

COAL CREEK TRIBUTARY-FLAT ROCK CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit 7 Flat Rock Creek (continued)								
H	11,635	1049	7,520	3.2	607.8	607.8	608.7	0.9
I	13,685	937	5,842	4.1	609.0	609.0	609.9	0.9
J	16,085	1062	7,290	3.3	610.6	610.6	611.5	0.9
K	17,911	900	5,851	4.1	611.8	611.8	612.6	0.8
L	19,386	1395	9,454	2.7	613.0	613.0	614.0	1.0
M	21,211	999	5,538	2.8	613.9	613.9	614.9	1.0
N	23,111	999	6,071	2.5	615.3	615.3	616.2	0.9
O	25,611	750	3,223	4.7	617.3	617.3	618.2	0.9
P	27,015	250	2,470	6.2	620.4	620.4	521.2	0.8
Q	27,767	167	1,920	7.9	621.9	621.9	622.2	0.3
R	28,867	152	1,657	7.4	623.0	623.0	623.6	0.6
S	29,792	175	1,571	7.4	626.4	626.4	626.5	0.1
T	31,367	173	1,345	8.6	629.4	629.4	629.5	0.1
U	32,367	154	1,401	8.3	631.8	631.8	631.8	0.0
V	33,707	202	1,470	7.8	638.7	638.7	638.7	0.0
W*	34,832	175	1,829	6.2	644.6	644.6	644.9	0.3
X*	36,132	200	1,950	5.8	647.0	647.0	647.2	0.2

[1] Feet above mouth

*Outside corporate limits

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

FLAT ROCK CREEK

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 7 Flat Rock Creek Tributary A								
A	825	58	567	4.9	601.9	592.6[2]	593.6[2]	1.0
B	1,975	62	602	4.6	602.2	595.2[2]	595.7[2]	0.5
C	3,625	80	917	3.0	602.8	597.4[2]	597.7[2]	0.3
D	4,926	155	853	3.2	607.8	606.8[2]	606.8[2]	0.0
E	6,076	63	440	6.2	608.4	608.4	609.3	0.9
F	7,101	54	277	9.9	616.7	616.7	616.7	0.0
Dirty Butter Creek								
A	3,625	362	2,603	4.1	614.9	613.5[2]	614.5[2]	1.0
B	5,895	520	3,500	3.1	617.8	617.8	618.8	1.0
C	7,612	520	3,238	3.3	621.7	621.7	621.9	0.2
D	8,612	460	2,442	4.5	622.8	622.8	623.3	0.5
E	10,150	371	3,510	3.1	626.0	626.0	626.8	0.8
F	11,720	209	1,014	7.7	631.8	631.8	631.9	0.1
G	12,514	320	2,056	3.8	635.3	635.3	635.9	0.6
H	13,114	570	3,276	2.4	635.9	635.9	636.6	0.7
I	13,841	347	1,267	4.9	636.2	636.2	637.2	1.0
J	15,466	205	1,185	5.3	641.7	641.7	642.6	0.9

[1] Feet above mouth

[2] Water-surface elevation computed without consideration of coincident flooding effects

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

FLAT ROCK CREEK TRIBUTARY A-DIRTY BUTTER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 7 Dirty Butter Creek (continued)								
K	16,766	212	1,240	5.0	647.4	647.4	648.0	0.6
L	17,466	250	1,906	3.3	648.3	648.3	649.0	0.7
M	18,790	79	1,012	6.2	655.6	655.6	655.6	0.0
N	19,115	79	1,039	5.3	655.7	655.7	655.7	0.0
Dirty Butter Creek Tributary								
A	775	94	565	6.5	629.3	629.3	630.3	1.0
B	1,409	50	834	4.4	641.4	641.4	641.4	0.0
C	2,684	86	879	4.5	641.5	641.5	642.1	0.6
D	3,684	71	638	6.1	644.8	644.8	645.0	0.2
E	4,229	94	612	6.4	646.2	646.2	646.7	0.5
F	5,254	160	588	6.7	650.3	650.3	650.8	0.5

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

DIRTY BUTTER CREEK-DIRTY BUTTER CREEK TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 7 Valley View Creek								
A	425	81	592	6.3	622.0	622.0	622.7	0.7
B	1,400	73	424	8.8	622.4	622.4	622.5	0.1
C	2,671	115	742	5.0	627.5	627.5	627.5	0.0
D	3,742	63	407	9.2	631.2	631.2	631.2	0.0
E	4,499	56	584	6.4	641.0	641.0	641.4	0.4
F	5,101	48	531	7.0	645.4	645.4	645.4	0.0
G	5,826	48	399	8.7	645.6	645.6	645.6	0.0
H	6,560	39	204	12.6	645.9	645.9	645.9	0.0
I	7,861	35	193	13.4	657.0	657.0	657.0	0.0
J	8,151	38	198	13.0	658.5	658.5	658.5	0.0
K	8,868	38	198	13.0	664.4	664.4	664.4	0.0
L	9,143	38	198	13.0	666.4	666.4	666.4	0.0
Watershed Unit No. 8 Mingo Creek								
A	2,000	980	1,170	3.0	590.3	590.3	591.3	1.0
B	2,200	1750	25,120	1.4	591.5	591.5	592.5	1.0
C	3,290	1460	19,180	1.8	591.6	591.6	592.6	1.0

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

VALLEY VIEW CREEK-MINGO CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Mingo Creek (continued)								
D	5,590	2260	24,250	1.4	592.2	592.2	593.2	1.0
E	9,100	2110	24,510	1.4	592.8	592.8	593.8	1.0
F	10,710	1300	13,920	2.5	593.8	593.8	594.8	1.0
G	10,910	1390	16,690	2.1	595.6	595.6	596.2	0.6
H	12,650	540	6,560	5.3	597.0	597.0	597.6	0.6
I	13,790	540	9,210	3.8	600.0	600.0	600.9	0.9
J	15,430	490	7,620	4.5	603.1	603.1	604.1	1.0
K	16,850	410	7,840	4.4	606.7	606.7	607.7	1.0
L	18,370	1350	11,640	3.0	612.4	612.4	613.3	0.9
M	21,320	2510	43,020	0.8	612.8	612.8	613.7	0.9
N	25,590	3150	46,850	0.7	612.9	612.9	613.8	0.9
O	28,220	2440	37,150	0.9	613.0	613.0	614.0	1.0
P	30,050	2880	43,410	0.8	613.1	613.1	614.1	1.0
Q	31,390	2920	35,230	0.9	613.2	613.2	614.2	1.0
R	32,840	2410	23,100	1.3	613.4	613.4	614.4	1.0
S	34,280	320	6,320	5.0	613.8	613.8	614.7	0.9
T	35,370	430	6,150	5.3	614.2	614.2	615.1	0.9
U	36,900	280	5,080	6.4	614.9	614.9	615.7	0.8
V	38,680	330	5,030	6.4	616.0	616.0	616.7	0.7

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

MINGO CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Mingo Creek (continued)								
W	39,130	270	4,010	8.1	617.7	617.7	617.9	0.2
X	40,270	240	3,760	7.4	618.8	618.8	619.1	0.3
Y	40,440	310	4,710	5.9	619.7	619.7	619.7	0.0
Z	42,860	270	4,040	6.9	621.1	621.1	621.3	0.2
AA	44,390	260	4,100	5.9	622.3	622.3	622.5	0.2
AB	45,560	220	2,920	7.6	622.8	622.8	623.1	0.3
AC	47,180	1590	9,560	2.3	631.5	631.5	632.4	0.9
AD	50,710	1420	12,120	2.0	635.8	635.8	636.8	1.0
AE	53,090	1520	14,250	1.7	638.2	638.2	639.2	1.0
AF	54,650	1230	8,510	2.9	640.6	640.6	641.6	1.0
AG	57,120	1200	10,780	2.3	642.9	642.9	643.8	0.9
AH	59,320	200	2,980	7.4	643.3	643.3	644.2	0.9
AI	59,850	190	2,770	5.8	644.1	644.1	645.1	1.0
AJ	60,000	350	2,960	5.4	644.6	644.6	645.4	0.8
AK	61,110	210	3,050	5.3	645.3	645.3	646.3	1.0
AL	63,240	180	2,360	5.2	647.6	647.6	648.5	0.9
AM	64,370	180	2,250	5.4	648.5	648.5	649.3	0.8
AN	65,770	160	1,850	5.2	650.3	650.3	650.9	0.6
AO	66,550	160	1,960	4.9	652.3	652.3	652.9	0.6

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[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

MINGO CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Mingo Creek (continued)								
AP	67,370	110	1,090	7.6	653.5	653.5	653.9	0.4
AQ	68,130	120	1,090	7.6	655.4	655.4	655.6	0.2
AR	69,970	170	1,710	4.2	660.1	660.1	660.6	0.5
AS	70,930	110	980	5.3	660.7	660.7	661.2	0.5
AT	72,280	140	1,340	3.8	662.1	662.1	662.5	0.4
AU	72,640	100	980	5.2	663.6	663.6	663.9	0.3
AV	74,170	80	480	6.4	668.4	668.4	668.8	0.4
AW	75,060	90	540	5.7	670.1	670.1	670.6	0.5
AX	75,540	50	390	7.8	670.1	670.1	670.6	0.5
AY	76,490	110	740	4.1	673.4	673.4	673.6	0.2
AZ	77,300	100	610	5.0	674.4	674.4	674.5	0.1
BA	78,380	90	440	6.9	676.9	676.9	676.9	0.0
BB	79,200	260	1,010	2.8	683.8	683.8	684.8	1.0
BC	80,970	380	2,820	0.9	690.0	690.0	690.9	0.9
BD	81,630	690	1,050	2.4	691.4	691.4	692.4	1.0
BE	82,500	230	660	3.9	698.5	698.5	699.0	0.5
BF	83,580	320	1,190	1.6	703.1	703.1	703.9	0.8
BG	84,350	260	1,080	1.8	704.5	704.5	705.5	1.0
BH	85,160	60	370	5.1	708.0	708.0	708.6	0.6

[1] Feet above mouth

BEST COPY AVAILABLE

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

MINGO CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Douglas Creek								
A	2,430	840	8,130	0.6	613.4	613.0[2]	614.0[2]	1.0
B	3,790	380	1,340	3.6	614.4	614.4	614.9	0.5
C	4,710	510	3,280	1.2	618.4	618.4	618.9	0.5
D	5,730	400	1,500	2.7	618.8	618.8	619.6	0.8
E	6,580	220	1,260	3.2	621.1	621.1	622.1	1.0
F	7,500	120	920	4.4	623.9	623.9	624.9	1.0
Mill Creek								
A	1,950	350	2,410	3.6	631.7	631.7	632.7	1.0
B	2,350	400	2,180	4.0	632.3	632.3	633.2	0.9
C	3,480	500	1,920	2.6	634.4	634.4	635.3	0.9
D	4,020	210	690	7.2	635.2	635.2	636.1	0.9
E	4,620	200	1,330	3.7	640.9	640.9	641.3	0.4
F	5,040	200	1,280	3.9	641.7	641.7	642.1	0.4
G	6,000	300	1,220	4.1	644.9	644.9	645.0	0.1
H	7,500	150	790	5.8	650.8	650.8	651.2	0.4
I	8,460	150	820	5.6	657.1	657.1	657.2	0.1
J	10,050	*	*	*	670.4	*	*	*
K	10,630	*	*	*	675.5	*	*	*
L	11,370	*	*	*	679.2	*	*	*

[1] Feet above mouth

[2] Water-surface elevation computed without consideration of backwater effects

*Floodway not applicable (creek flows underground)

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

DOUGLAS CREEK-MILL CREEK

BEST COPY AVAILABLE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Mill Creek (continued)								
M	11,700	*	*	*	681.2	*	*	*
N	12,030	*	*	*	684.8	*	*	*
O	12,260	*	*	*	687.0	*	*	*
P	12,450	*	*	*	688.4	*	*	*
Q	13,000	*	*	*	693.3	*	*	*
R	13,750	*	*	*	697.1	*	*	*
S	14,530	100	660	4.4	703.2	703.2	704.2	1.0
T	15,270	180	1,060	2.7	708.9	708.9	709.0	0.1
U	15,970	150	1,180	2.4	718.1	718.1	718.1	0.0
V	16,800	200	1,020	2.8	723.5	723.5	723.7	0.2
W	17,180	200	1,390	2.1	728.0	728.0	729.0	1.0
X	17,480	80	450	4.4	728.5	728.5	729.4	0.9
Jones Creek								
A	300	170	1,300	3.1	633.5	633.5	634.5	1.0
B	1,260	190	1,160	3.4	636.5	636.5	636.8	0.3
C	2,490	100	480	5.8	641.9	641.9	642.2	0.3
D	3,580	170	960	2.9	646.3	646.3	647.2	0.9
E	4,730	160	710	2.8	653.3	653.3	654.2	0.9

[1] Feet above mouth

*Floodway not applicable (creek flows underground)

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

MILL CREEK-JONES CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Jones Creek (continued)								
F	6,140	370	1,680	1.2	657.7	657.7	657.9	0.2
G	6,510	360	920	1.2	662.5	662.5	662.5	0.0
H	7,390	370	800	1.4	669.4	669.4	669.4	0.0
I	7,980	*	*	*	673.0	*	*	*
J	8,730	*	*	*	678.7	*	*	*
K	9,150	*	*	*	682.0	*	*	*
L	9,640	*	*	*	686.2	*	*	*
M	9,950	*	*	*	686.6	*	*	*
Audubon Creek								
A	1,530	70	610	8.5	643.0	642.0[2]	643.0[2]	1.0
B	2,690	70	570	8.5	644.6	644.6	645.2	0.6
C	3,250	600	1,900	2.6	648.2	648.2	648.7	0.5
D	4,020	590	1,550	3.2	649.5	649.5	649.9	0.4
E	4,940	550	1,080	4.3	655.3	655.3	655.3	0.0
F	5,590	160	930	5.0	657.7	657.7	658.7	1.0
G	5,910	210	1,022	4.2	659.2	659.2	660.2	1.0
H	7,390	70	540	4.7	662.1	662.1	663.1	1.0
I	8,020	80	580	4.4	663.1	663.1	663.8	0.7

[1] Feet above mouth

[2] Water-surface elevation computed without consideration of backwater effects

*Floodway not determined (flows remain within channel)

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

JONES CREEK-AUDUBON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Audubon Creek (continued)								
J	9,090	50	510	7.3	668.6	668.6	669.3	0.7
K	9,830	50	540	6.3	671.5	671.5	672.3	0.8
L	10,830	90	490	6.0	673.6	673.6	674.6	1.0
M	11,220	50	380	7.6	676.2	676.2	676.7	0.5
N	11,640	40	310	8.8	682.4	682.4	682.7	0.3
Bell Creek								
A	270	120	910	7.1	645.1	645.1	646.1	1.0
B	1,300	100	840	5.4	648.3	648.3	648.6	0.3
C	1,870	90	560	8.1	648.8	648.8	649.1	0.3
D	2,800	100	670	6.7	652.0	652.0	652.2	0.2
E	4,110	60	340	6.2	656.8	656.8	657.0	0.2
F	4,760	320	1,050	2.3	660.2	660.2	661.2	1.0
G	5,550	70	300	4.6	662.0	662.0	662.7	0.7
H	5,880	60	320	4.4	662.8	662.8	663.6	0.8
I	6,110	160	620	2.3	667.3	667.3	667.3	0.0
J	6,430	40	560	5.5	669.9	669.9	669.9	0.0

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

AUDUBON CREEK-BELL CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Bell Creek Tributary								
A	260	200	1,100	2.0	656.4	656.4	657.4	1.0
B	780	80	600	3.8	656.5	656.5	657.5	1.0
C	1,160	300	1,620	1.4	661.1	661.1	662.1	1.0
D	1,540	470	2,680	0.8	661.3	661.3	662.3	1.0
E	1,890	430	2,500	0.8	664.1	664.1	665.1	1.0
F	2,470	290	1,080	2.0	664.4	664.4	665.4	1.0
G	3,320	210	850	2.1	667.4	667.4	668.0	0.6
H	3,760	70	330	5.5	667.9	667.9	668.8	0.9
I	4,350	50	230	7.7	671.3	671.3	671.4	0.1
J	4,810	60	320	5.6	674.8	674.8	674.9	0.1
K	5,770	70	360	3.6	676.3	676.3	676.9	0.6
L	6,800	50	180	7.3	680.3	680.3	680.3	0.0
Fulton Creek								
A	320	130	570	3.5	649.1	649.1	649.9	0.8
B	880	60	440	4.6	649.7	649.7	650.6	0.9
C	1,500	40	310	6.4	650.5	650.5	651.5	1.0
D	1,830	60	280	7.2	652.4	652.4	653.2	0.8
E	2,520	60	300	6.0	655.8	655.8	656.8	1.0

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[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

BELL CREEK TRIBUTARY-FULTON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Fulton Creek (continued)								
F	3,020	50	280	6.4	658.1	658.1	658.4	0.3
G	4,020	70	400	4.4	662.6	662.6	663.6	1.0
H	4,640	40	310	5.1	664.6	664.6	665.5	0.9
I	5,400	50	330	4.7	666.9	666.9	667.6	0.7
Alsuma Creek								
A	280	50	250	5.8	657.9	657.9	658.7	0.8
B	790	120	290	5.1	662.8	662.8	663.8	1.0
C	1,290	130	430	3.4	665.2	665.2	666.1	0.9
D	1,460	180	330	4.2	665.6	665.6	666.3	0.7
E	1,940	200	570	2.4	667.6	667.6	668.6	1.0
F	2,920	320	1,870	0.7	670.7	670.7	671.7	1.0
G	3,460	160	830	1.5	671.1	671.1	672.0	0.9
H	3,940	380	1,080	1.2	672.6	672.6	673.3	0.7

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

FULTON CREEK-ALSUMA CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Quarry Creek								
A	640	520	6,290	1.0	612.3	607.7[2]	608.7[2]	1.0
B	2,130	870	4,100	1.6	612.3	608.6[2]	609.5[2]	0.9
C	2,550	510	3,760	1.7	613.6	613.6	614.5	0.9
D	3,540	150	1,010	6.0	614.8	614.8	615.7	0.9
E	4,040	230	1,170	5.1	618.7	618.7	619.7	1.0
F	5,890	350	1,840	3.3	627.2	627.2	628.1	0.9
G	7,110	220	1,300	4.3	633.0	633.0	633.9	0.9
H	7,580	190	1,290	4.3	634.1	634.1	635.0	0.9
I	8,330	200	860	6.5	636.6	636.6	637.5	0.9
J	9,320	350	1,430	3.8	642.1	642.1	643.1	1.0
K	10,420	270	1,070	5.1	646.3	646.3	647.3	1.0
L	10,780	300	1,310	4.1	648.8	648.8	649.8	1.0
M	11,600	220	1,050	4.5	653.1	653.1	654.0	0.9
N	12,690	320	1,330	2.2	657.9	657.9	658.8	0.9
O	13,940	160	870	3.5	667.4	667.4	668.3	0.9
P	14,790	220	1,370	2.1	670.5	670.5	671.4	0.9
Q	16,800	180	820	2.9	680.8	680.8	681.8	1.0

[1] Feet above mouth

[2] Water-surface elevation computed without consideration of backwater effects

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

QUARRY CREEK

BEST COPY AVAILABLE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Eagle Creek								
A	3,210	280	760	3.0	613.9	613.9	614.8	0.9
B	3,770	190	600	3.8	615.3	615.3	616.1	0.8
C	4,290	170	880	2.3	619.8	619.8	620.6	0.8
D	4,580	490	5,110	0.4	629.3	629.3	630.2	0.9
E	5,670	280	1,910	1.1	629.4	629.4	630.3	0.9
F	6,750	130	360	5.1	632.8	632.8	633.1	0.3
G	7,150	210	480	3.9	635.7	635.7	636.1	0.4
H	7,700	330	1,190	1.6	642.6	642.6	643.4	0.8
I	8,860	220	610	3.1	646.7	646.7	647.3	0.6
J	9,440	280	1,410	1.1	648.7	648.7	649.7	1.0
K	10,810	170	550	2.7	651.6	651.6	652.1	0.5
L	12,020	240	680	2.2	656.5	656.5	657.0	0.5
Cooley Creek								
A	2,580	640	5,100	1.4	630.5	630.5	631.0	0.5
B	3,550	720	4,300	1.6	630.7	630.7	631.3	0.6
C	3,990	540	2,060	3.3	631.1	631.1	632.1	1.0
D	4,600	270	1,340	6.1	634.7	634.7	635.5	0.8
E	4,940	260	1,150	7.1	638.0	638.0	638.3	0.3
F	5,530	150	1,220	6.6	641.5	641.5	642.4	0.9

[1] Feet above mouth

BEST COPY AVAILABLE

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

EAGLE CREEK-COOLEY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Cooley Creek (continued)								
G	5,900	310	2,370	3.4	644.0	644.0	645.0	1.0
H	6,290	300	2,588	3.1	645.3	645.3	646.3	1.0
I	7,150	562	2,690	3.0	646.4	646.4	647.2	0.8
J	8,130	195	995	8.0	648.2	648.2	648.2	0.0
K	8,590	422	917	8.7	653.6	653.6	654.3	0.7
L	8,990	290	2,690	3.1	655.0	655.0	655.9	0.9
M	9,450	180	1,440	5.5	655.7	655.7	656.6	0.9
N	10,130	150	740	5.7	657.1	657.1	658.0	0.9
O	11,100	100	660	6.4	662.4	662.4	663.4	1.0
P	11,730	150	1,690	2.3	670.3	670.3	670.9	0.6
Q	12,560	330	2,700	1.4	675.2	675.2	675.5	0.3
R	13,300	410	2,190	1.8	675.3	675.3	675.6	0.3
S	14,310	610	4,770	0.8	683.6	683.6	684.4	0.8
T	15,250	220	1,300	3.0	683.7	683.7	684.4	0.7
U	15,970	200	770	4.5	684.4	684.4	685.2	0.8
V	16,730	140	450	7.7	691.1	691.1	691.3	0.2
W	17,900	440	1,030	1.8	694.5	694.5	695.5	1.0

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

COOLEY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Cooley Creek Tributary								
A	640	180	1,090	3.3	657.5	657.5	658.5	1.0
B	1,120	150	780	4.5	659.8	659.8	660.7	0.9
C	2,000	170	1,090	3.3	668.2	668.2	669.1	0.9
D	2,810	180	890	4.0	674.4	674.4	675.4	1.0
E	2,970	190	1,590	2.1	674.9	674.9	675.9	1.0
F	3,430	260	2,370	1.4	678.5	678.5	679.5	1.0
G	3,860	220	1,670	2.0	678.6	678.6	679.6	1.0
H	4,510	170	810	4.2	679.3	679.3	680.2	0.9
I	5,170	100	450	5.9	681.8	681.8	682.7	0.9
J	5,590	170	700	3.8	685.6	685.6	686.5	0.9
K	6,780	170	840	3.1	692.3	692.3	693.2	0.9
L	7,430	240	940	2.8	696.0	696.0	696.9	0.9
M	8,380	230	950	2.8	699.5	699.5	700.4	0.9
N	9,520	180	660	3.3	703.6	703.6	704.5	0.9
O	10,000	200	620	3.5	706.6	706.6	707.6	1.0
P	10,660	100	320	6.8	710.3	710.3	711.0	0.7
Q	11,050	90	450	4.8	713.7	713.7	714.7	1.0
R	11,790	150	720	3.0	716.2	716.2	717.2	1.0
S	12,220	80	410	5.3	717.7	717.7	718.6	0.9

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

COOLEY CREEK TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Cooley Creek Tributary (continued)								
T	12,870	110	550	3.9	721.1	721.1	722.0	0.9
U	13,890	100	490	4.4	724.9	724.9	725.8	0.9
V	14,400	80	400	4.2	727.5	727.5	728.4	0.9
W	14,590	90	499	3.4	728.6	728.6	729.5	0.9
X	15,400	60	370	4.6	732.2	732.2	733.2	1.0
Y	16,770	70	470	3.7	738.3	738.3	739.2	0.9
Z	18,220	60	370	4.6	744.8	744.8	745.2	0.4
AA	19,610	90	280	6.0	754.8	754.8	755.2	0.4
Tupelo Creek								
A	1,430	160	1,060	4.6	626.0	626.0	627.0	1.0
B	2,240	100	680	7.2	628.3	628.3	629.3	1.0
C	2,700	220	1,290	3.8	630.1	630.1	631.0	0.9
D	3,530	700	3,280	1.5	631.3	631.3	632.3	1.0
E	3,780	350.	1,010	4.9	633.3	633.3	633.6	0.3
F	4,160	160	1,260	3.9	635.2	635.2	636.0	0.8
G	5,360	270	1,410	3.5	639.8	639.8	640.8	1.0

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

COOLEY CREEK TRIBUTARY - TUPELO CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Tupelo Creek (continued)								
H	6,280	250	1,600	3.1	642.2	642.2	643.2	1.0
I	7,310	450	1,910	2.2	644.4	644.4	645.4	1.0
J	7,950	160	970	4.3	646.3	646.3	647.2	0.9
K	8,500	600	1,990	2.1	650.0	650.0	650.9	0.9
L	8,900	220	880	3.4	650.4	650.4	651.3	0.9
M	9,640	140	780	3.9	653.8	653.8	654.2	0.4
N	10,080	320	1,160	2.6	656.0	656.0	656.9	0.9
O	10,530	80	560	5.4	657.6	657.6	658.4	0.8
P	10,790	50	380	7.8	657.6	657.6	658.6	1.0
Q	11,240	150	720	4.1	661.1	661.1	661.9	0.8
R	12,140	100	300	6.1	662.9	662.9	663.2	0.3
S	12,830	220	910	2.0	667.1	667.1	667.7	0.6
T	13,980	270	500	3.7	671.6	671.6	672.6	1.0
Tupelo Creek Tributary								
A	740	300	250	5.8	654.0	654.0	654.7	0.7
B	1,180	100	330	4.4	659.3	659.3	660.1	0.8

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

TUPELO CREEK-TUPELO CREEK TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Tupelo Creek Tributary (continued)								
C	1,690	90	370	4.0	663.4	663.4	664.4	1.0
D	2,030	120	460	3.2	667.4	567.4	668.4	1.0
E	2,380	180	800	1.8	669.6	669.6	670.6	1.0
F	2,790	80	200	5.9	669.7	669.7	670.5	0.8
G	3,190	*	*	*	675.1	*	*	*
H	3,850	*	*	*	681.8	*	*	*
Brookhollow Creek								
A	1,250	180	1,510	3.9	645.9	645.9	646.9	1.0
B	2,700	290	1,920	3.1	649.7	649.7	650.7	1.0
C	3,460	270	2,350	2.5	650.7	650.7	651.7	1.0
D	4,170	340	2,190	2.7	652.0	652.0	653.0	1.0
E	4,700	120	1,260	4.7	652.5	652.5	653.5	1.0
F	5,180	130	1,120	5.3	654.2	654.2	654.9	0.7
G	5,800	80	680	5.8	656.6	656.6	656.9	0.3
H	6,570	160	1,230	3.2	661.4	661.4	662.1	0.7

[1] Feet above mouth

*Floodway not applicable (School Park)

TABLE 3	FEDERAL EMERGENCY MANAGEMENT AGENCY **CITY OF TULSA, OK** (TULSA, OSAGE AND ROGERS COS.)	**FLOODWAY DATA** **TUPELO CREEK TRIBUTARY-BROOKHOLLOW CREEK**

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Brookhollow Creek (continued)								
I	7,550	90	640	6.1	664.2	664.2	665.2	1.0
J	8,300	160	1,040	3.8	669.0	669.0	669.6	0.6
K	8,970	170	790	5.0	673.1	673.1	674.1	1.0
L	9,500	60	930	7.0	678.1	678.1	679.1	1.0
M	10,140	200	870	4.6	683.3	683.3	684.1	0.8
N	10,760	230	1,090	3.6	687.2	687.2	688.2	1.0
O	11,660	200	1,300	3.0	692.2	692.2	693.2	1.0
P	12,200	380	2,010	1.6	693.9	693.9	694.9	1.0
Q	12,720	350	1,170	2.8	695.1	695.1	696.0	0.9
R	13,130	180	850	3.9	698.0	698.0	698.9	0.9
S	13,830	100	700	4.7	701.3	701.3	702.3	1.0
T	14,400	90	650	5.1	703.4	703.4	704.2	0.8
U	15,000	80	640	5.2	706.9	706.9	707.5	0.6
V	16,230	60	540	4.3	710.0	710.0	710.8	0.8
W	16,900	80	420	5.4	710.7	710.7	711.6	0.9
X	17,290	50	250	9.3	712.7	712.7	712.8	0.1
Y	17,780	140	520	4.4	720.3	720.3	720.6	0.3
Z	19,060	120	550	2.1	725.7	725.7	726.5	0.8
AA	19,760	80	340	3.4	728.4	728.4	729.3	0.9

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

BROOKHOLLOW CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Brookhollow Creek Tributary								
A	1,580	90	700	3.1	659.0	659.0	659.9	0.9
B	2,530	110	760	2.7	663.7	663.7	664.4	0.7
C	3,260	290	540	3.8	665.9	665.9	666.8	0.9
D	3,710	480	920	2.2	668.9	668.9	669.9	1.0
E	4,310	150	610	3.4	672.5	672.5	673.5	1.0
F	4,710	120	580	3.6	674.9	674.9	675.9	1.0
G	5,410	70	520	3.0	678.4	678.4	679.3	0.9
H	5,930	80	300	5.2	679.6	679.6	680.5	0.9
I	6,370	90	220	7.2	684.7	684.7	684.7	0.0
J	6,700	70	250	6.3	688.3	688.3	688.5	0.2
K	7,210	140	400	3.9	692.2	692.2	692.3	0.1
Sugar Creek								
A	1,960	80	540	4.1	651.3	651.3	651.7	0.4
B	2,980	230	890	2.4	656.7	656.7	657.4	0.7
C	4,210	70	480	4.4	660.9	660.9	661.6	0.7
D	4,830	80	510	4.0	662.6	662.6	663.4	0.8
E	5,220	100	440	4.6	664.6	664.6	665.4	0.8

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

BROOKHOLLOW CREEK TRIBUTARY-SUGAR CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Sugar Creek (continued)								
F	5,730	190	750	2.6	666.9	666.9	667.8	0.9
G	7,080	480	1,720	1.0	670.4	670.4	671.4	1.0
H	8,020	140	650	2.5	672.9	672.9	673.5	0.6
I	9,330	70	290	5.4	678.6	678.6	678.6	0.0
J	10,440	120	550	2.7	683.7	683.7	684.7	1.0
K	11,340	100	580	2.5	687.7	687.7	688.7	1.0
L	12,100	190	670	2.1	689.7	689.7	690.0	0.3
M	12,700	141	620	2.2	694.0	694.0	694.5	0.5
Southpark Creek								
A	1,660	210	830	1.8	656.3	656.3	657.1	0.8
B	2,380	250	810	1.8	657.2	657.2	658.1	0.9
C	2,880	160	340	4.5	659.5	659.5	660.3	0.8
D	3,750	140	430	3.1	661.6	661.6	662.6	1.0
E	4,360	100	410	3.3	663.6	663.6	664.5	0.9
F	4,980	170	720	1.8	664.1	664.1	665.0	0.9
G	6,150	160	610	2.0	666.6	666.6	667.5	0.9
H	6,890	110	390	3.1	668.7	668.7	669.4	0.7

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[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

SUGAR CREEK-SOUTHPARK CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8 Southpark Creek (continued)								
I	7,540	230	830	1.5	671.7	671.7	672.4	0.7
J	8,580	140	470	2.1	672.9	672.9	673.4	0.5
K	9,400	190	510	1.9	675.5	675.5	676.1	0.6
Ford Creek								
A	870	220	1,403	1.8	660.7	660.7	661.7	1.0
B	2,510	180	1,090	2.3	663.1	663.1	664.1	1.0
C	3,670	330	1,090	2.3	664.6	664.6	665.6	1.0
D	4,900	210	740	3.4	666.7	666.7	667.6	0.9
E	7,415	221	864	2.6	671.3	671.3	672.2	0.9
F	9,065	166	677	3.3	675.0	675.0	675.8	0.8
G	9,595	99	536	4.2	675.9	675.9	676.8	0.9
H	11,210	33	224	8.6	682.1	682.1	682.1	0.0
I	12,890	94	520	3.7	690.0	690.0	690.3	0.3
J	13,480	86	428	4.5	691.4	691.4	691.6	0.2
K	13,800	94	503	3.8	693.0	693.0	693.2	0.2
L	14,100	68	198	9.8	698.5	698.5	698.5	0.0
M	14,760	67	290	6.7	702.2	702.2	702.8	0.6

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[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

SOUTHPARK CREEK-FORD CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 8								
Ford Creek (continued)								
N	15,500	55	283	6.8	706.0	706.0	706.7	0.7
O	15,720	100	370	4.3	708.0	708.0	708.5	0.5
P	16,550	140	600	2.6	711.4	711.4	712.2	0.8
Q	17,500	310	1,230	1.3	717.9	717.9	718.7	0.8
R	17,900	170	630	2.5	721.1	721.1	722.1	1.0
Catfish Creek								
A	1,460	150	830	2.7	668.6	668.6	669.6	1.0
B	2,100	50	350	6.5	669.6	669.6	670.6	1.0
C	3,270	150	630	2.6	672.5	672.5	673.3	0.8
D	4,410	100	430	3.8	674.8	674.8	675.8	1.0
E	5,590	160	530	3.1	679.8	679.8	680.8	1.0
F	6,360	220	600	2.7	682.5	682.5	683.5	1.0
Watershed Unit No. 9								
Spunky Creek Tributary A								
A	8,213	212	1,043	1.3	634.2	634.2	635.2	1.0
B	9,000	78	404	3.4	637.5	637.5	638.5	1.0

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

FORD CREEK-CATFISH CREEK-SPUNKY CREEK TRIBUTARY A

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 9 Spunky Creek Tributary A (continued)								
C	9,870	50	221	6.2	643.5	643.5	643.6	0.1
D	11,450	128	449	3.1	651.3	651.3	652.2	0.9
E	12,880	74	241	5.7	659.0	659.0	660.0	1.0
Spunky Creek Tributary B								
A	1,680	91	894	4.7	628.5	628.5	629.1	0.6
B	2,850	347	1,763	2.6	629.8	629.8	630.6	0.8
C	4,200	334	1,067	4.3	631.8	631.8	632.8	1.0
D	6,880	163	527	6.3	639.1	639.1	640.0	0.9
E	9,700	185	1,000	2.9	658.2	658.2	659.1	0.9
F	10,530	124	320	5.8	660.3	660.3	661.0	0.7
G	12,150	175	598	3.1	668.9	668.9	669.9	1.0

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

SPUNKY CREEK TRIBUTARY A-SPUNKY CREEK TRIBUTARY B

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 9								
Spunky Creek Tributary B-1								
A	550	58	299	4.2	632.3	631.4[2]	632.4[2]	1.0
B	2,400	89	315	4.0	640.2	640.2	641.1	0.9
C	5,380	52	204	6.2	651.9	651.9	652.9	1.0
D	6,120	62	279	4.5	655.6	655.6	656.6	1.0
E	7,730	42	177	7.1	662.8	662.8	663.8	1.0
F	8,800	27	121	10.5	670.7	670.7	670.7	0.0
Watershed Unit No. 10								
Harlow Creek								
F	6,712	*	*	*	659.4	*	*	*
G	7,938	80	1,048	4.5	661.2	661.2	661.2	0.0
H	8,588	80	1,125	4.1	661.2	661.2	661.3	0.1
I	8,711	100	1,038	4.4	661.3	661.3	661.4	0.1
J	9,505	225	2,189	2.1	661.3	661.3	662.2	0.9
K	10,465	225	1,906	2.4	661.4	661.4	662.4	1.0
L	11,515	200	1,218	3.8	661.8	661.8	662.8	1.0
M	12,965	157[3]	612	5.5	664.3	664.3	665.0	0.7
N[4]	14,465	128	745	4.6	668.9	668.9	669.9	1.0

[1] Feet above mouth

[2] Water-surface elevation computed without consideration of backwater effects

[3] This width extends beyond corporate limits

*Floodway not applicable, creek bounded by levee

[4] Located outside corporate limits

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

SPUNKY CREEK TRIBUTARY B-1-HARLOW CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Harlow Creek Tributary								
E	3,684	175	589	5.1	665.3	665.3	665.4	0.1
F	4,644	170	626	4.8	665.7	665.7	666.7	1.0
G	5,019	75	416	7.1	670.1	670.1	670.1	0.0
H	7,319	70	386	6.0	682.4	682.4	682.4	0.0
Blackboy Creek								
A-B	*	*	*	*	*	*	*	*
C	2,844	856	12,532	0.7	655.6	656.6	656.6	0.0
D-H	*	*	*	*	*	*	*	*
I	9,383	125	612	6.1	670.3	670.3	671.3	1.0

[1] Feet above mouth

*Located outside corporate limits.

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

HARLOW CREEK TRIBUTARY

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Watershed Unit No. 11								
Vensel Creek								
A	1,700	*	*	*	614.8	*	*	*
B	3,800	*	*	*	615.6	*	*	*
C	5,800	*	*	*	616.4	*	*	*
Fred Creek								
A	600	80	883	6.4	616.1	614.8[2]	614.8	0.0
B	2,923	153	1,379	4.1	620.9	620.9	621.8	0.9
C	4,698	129	1,270	3.6	621.8	621.8	622.7	0.9

[1] Feet above confluence with Arkansas River

[2] Elevation computed without consideration of backwater from Arkansas River

*Floodway not applicable

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

VENSEL CREEK-FRED CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 11 Fred Creek (continued)								
D	6,541	140	1,127	4.2	623.1	623.1	623.8	0.7
E	9,131	74	482	6.0	628.7	628.7	629.2	0.5
F	9,706	80	748	3.9	631.1	631.1	631.6	0.5
G	12,181	116	798	5.2	644.0	644.0	644.6	0.6
H	14,547	78	524	7.8	654.7	654.7	654.7	0.0
I	15,877	192	843	4.9	663.6	663.6	664.3	0.7
J	17,677	139	1,095	3.7	673.9	673.9	674.5	0.6
K	18,615	142	910	4.0	680.4	680.4	681.4	1.0
L	19,615	75	576	6.3	687.7	687.7	688.3	0.6
M	21,359	65	227	6.1	701.1	701.1	702.0	0.9
Joe Creek								
A	1,000	240[2]	*	*	618.7	*	*	*
B	4,600	190[2]	*	*	622.5	*	*	*
C	7,520	200[2]	*	*	626.9	*	*	*
D	10.720	100[2]	*	*	634.3	*	*	*
E	11,769	100[2]	*	*	637.5	*	*	*
F	15,014	115[2]	*	*	640.9	*	*	*
G	17,910	85[2]	*	*	650.9	*	*	*

[1] Feet above mouth

[2] 100-year flood plain designated as floodway

*Floodway not computed (flows remain in channel)

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

FRED CREEK-JOE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 11 South Fork Joe Creek								
A	350	34	180	13.2	648.5	646.6[2]	646.6[2]	0.0
B	2,566	45	354	6.8	664.3	664.3	664.4	0.1
C	4,500	174	567	3.5	679.8	679.8	680.5	0.7
D	6,983	1880	196	8.0	697.0	697.0	697.2	0.2
Little Joe Creek								
A	644	75	725	10.1	651.3	651.3	651.3	0.0
B	1,532	55	704	10.4	655.1	655.1	655.1	0.0
C	3,182	60	364	20.2	659.7	659.7	659.7	0.0
D	4,082	90	488	17.2	665.4	665.4	665.4	0.0
E	6,011	173	1,184	5.6	680.1	680.1	680.9	0.8
F	6,911	85	783	4.5	688.7	688.7	689.0	0.3
G	9,021	197	875	4.0	697.7	697.7	698.0	0.3
H	10,403	189	625	0.9	706.0	706.0	707.0	1.0
I	11,933	114	474	1.9	718.0	718.0	719.0	1.0
J	13,333	219	1,336	0.7	720.3	720.3	721.3	1.0

[1] Feet above mouth

[2] Water-surface elevation computed without consideration of backwater effects.

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

SOUTH FORK JOE CREEK-LITTLE JOE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 11 South Fork Little Joe Creek								
A	500	73	486	3.2	690.1	690.1	690.8	0.7
B	1,980	78	293	5.3	700.7	700.7	700.7	0.0
C	4,110	166	313	3.0	720.0	720.0	721.0	1.0
D	5,070	95	207	4.6	728.8	728.8	729.1	0.3
North Fork Little Joe Creek								
A	350	51	488	3.9	682.3	682.3	683.1	0.8
B	975	40	216	8.8	685.2	685.2	685.8	0.6
C	1,900	460	2,161	0.9	695.0	695.0	695.0	0.0
D	3,260	282	1,366	1.4	698.3	698.3	699.3	1.0
East Branch Joe Creek								
H	21,000	54	422	7.8	665.9	665.9	665.9	0.0
I	22,548	69	409	5.2	669.3	669.3	669.9	0.6

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

SOUTH FORK LITTLE JOE CREEK-NORTH FORK LITTLE JOE CREEK -EAST BRANCH JOE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE¹	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 11 Crow Creek								
A	100	68	602	7.5	628.6	628.6	628.6	0.0
B	1,800	58	483	9.3	636.4	636.4	636.4	0.0
C	3,300	78	715	6.3	646.4	646.4	646.4	0.0
D	4,550	130	1,062	4.3	651.3	651.3	651.7	0.4
E	5,350	139	709	6.4	655.3	655.3	655.8	0.5
F	6,770	147	1,202	3.6	664.3	664.3	665.1	0.8
G	8,300	317	1,434	3.0	669.9	669.9	669.9	0.0
H	9,750	238	1,740	2.5	679.7	679.7	680.2	0.5
Watershed Unit No. 12 Hager Creek								
C	7,920	533	1,760	0.8	628.1	628.1	628.6	0.5
D	9,250	640	1,390	1.0	628.5	628.5	629.0	0.5
E	12,240	481	1,954	1.8	629.1	629.1	630.1	1.0
F	14,382	492	3,109	1.1	638.9	638.9	639.8	0.9
G	17,392	99	606	2.2	661.4	661.4	662.0	0.6
H	19,582	50	236	5.7	681.5	681.5	681.8	0.3

¹Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

CROW CREEK-HAGER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 12 Mooser Creek								
A	770	85	930	6.9	627.1	627.1	627.6	0.5
B	2,420	305	2,640	2.2	633.4	633.4	634.4	1.0
C	4,750	71	658	8.6	638.3	638.3	638.7	0.4
D	5,990	106	1,148	4.9	646.9	646.9	647.8	0.9
E	7,300	329	2,416	2.2	651.5	651.5	652.5	1.0
F	10,200	156	933	3.0	663.4	663.4	664.3	0.9
G	12,200	68	342	7.3	673.5	673.5	673.5	0.0
H	13,650	95	500	5.0	686.6	686.6	686.7	0.1
I	14,620	57	436	5.3	688.9	688.9	689.4	0.5
J	14,900	88	950	2.4	694.3	694.3	694.9	0.6
K*	16,650	80	466	4.9	707.7	707.7	707.9	0.2
L	17,450	144/100[2]	592	3.9	713.2	713.2	714.2	1.0
Mooser Creek Tributary								
A	1,680	135	809	3.4	661.8	661.8	661.8	0.0
B	3,780	161	1,186	2.3	669.9	669.9	670.7	0.8
C	5,860	191	1,035	2.4	677.3	677.3	677.3	0.0

[1] Feet above mouth

[2] Total width/width within corporate limits

* Outside corporate limits

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

MOOSER CREEK-MOOSER CREEK TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 12 Cherry Creek (West Tulsa)								
A	1,700	75	771	7.8	625.7	624.2[3]	625.0[3]	0.8
B	3,850	115	1,128	5.1	629.9	629.9	630.2	0.3
C	6,100	1135	2,708	2.1	632.5	632.5	633.2	0.7
D	6,950	1213	2,830	0.6	632.9	632.9	633.8	0.9
E	8,500	86	486	3.7	633.2	633.2	634.2	1.0
Red Fork Creek								
A	800	60	561	8.0	637.5	637.5	637.5	0.0
B	1,325	445	415	10.8	642.5	642.5	642.5	0.0
C	2,680	386	1,228	3.7	644.5	644.5	645.1	0.6
D	3,620	123	820	4.8	649.3	649.3	650.3	1.0
Nickel Creek								
B	11,920	1248/1160[2]	6,410	1.2	634.2	634.2	635.2	1.0
C	12,800	880/350[2]	3,878	2.1	634.9	634.9	635.8	0.9

[1] Feet above mouth

[2] Total width/width within corporate limits

[3] Water-surface elevation computed without consideration of backwater effects.

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

CHERRY CREEK (WEST TULSA)-RED FORK CREEK-NICKEL CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 13 Haikey Creek								
BA	39,160	1590	8,110	2.5	636.7	636.7	637.5	0.8
BB	40,380	1300	6,750	3.0	637.7	637.7	638.5	0.8
BC	41,290	1160	6,010	3.4	639.1	639.1	639.9	0.8
West Branch Haikey Creek								
I	4,790	190	1,290	1.5	674.0	674.0	674.0	0.0
J	4,850	190	1,300	1.5	674.0	674.0	674.0	0.0
K	5,360	230	880	2.2	674.3	674.3	674.5	0.2
L	6,600	130	820	2.4	676.8	676.8	676.9	0.1
M	7,110	240	1,460	1.3	677.4	677.4	677.6	0.2
N	7,930	130	780	2.5	678.4	678.4	678.6	0.2
O	8,550	90	610	2.3	679.9	679.9	680.1	0.2
P	9,170	100	600	2.4	681.3	681.3	681.6	0.3
Q	10,930	80	420	2.8	686.6	686.6	687.0	0.4
R	11,920	210	790	1.5	689.9	689.9	690.1	0.2
S	12,250	120	540	1.9	690.7	690.7	690.8	0.1
T	13,130	110	480	2.1	693.1	693.1	693.1	0.0
U	13,600	180	520	2.0	694.6	694.6	694.6	0.0

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

HAIKEY CREEK-WEST BRANCH HAIKEY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 13 Little Haikey Creek								
K	14,400	540	4,250	1.4	647.1	647.1	647.3	0.2
L	15,720	190	1,100	5.4	647.6	647.6	647.9	0.3
M	16,720	470	1,840	3.2	652.4	652.4	652.6	0.2
N	18,200	590	2,620	2.3	654.1	654.1	654.3	0.2
O	19,050	530	1,840	3.3	655.5	655.5	655.6	0.1
P	20,150	500	2,080	2.9	658.3	658.3	658.4	0.1
Q	20,800	390	1,240	4.8	660.0	660.0	660.1	0.1
R	21,710	190	890	6.7	661.6	661.6	661.8	0.2
S	22,900	90	570	9.7	663.3	663.3	663.6	0.3
T	23,380	430	1,580	3.5	667.0	667.0	667.9	0.9
U	24,030	450	2,350	2.4	668.2	668.2	668.9	0.7
V	24,750	340	1,560	3.6	668.8	668.8	669.6	0.8
W	24,850	370	2,010	2.8	671.0	671.0	672.0	1.0
X	26,300	270	1,540	3.1	673.0	673.0	673.9	0.9
Y	26,750	250	930	5.2	674.3	674.3	674.8	0.5
Z	27,520	320	1,670	2.9	676.4	676.4	676.7	0.3
AA	28,150	360	1,460	3.3	677.4	677.4	677.7	0.3
AB	28,900	480	1,890	2.6	678.4	678.4	678.8	0.4
AC	30,150	530	1,200	4.1	680.7	680.7	681.4	0.7

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

LITTLE HAIKEY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 13 Little Haikey Creek (continued)								
AD	31,250	350	1,506	2.7	683.6	683.6	683.8	0.2
AE	31,970	210	850	4.7	684.7	684.7	685.2	0.5
AF	32,470	230	1,036	3.9	687.2	687.2	687.9	0.7
AG	32,830	146	626	6.4	688.2	688.2	688.2	0.0
AH	33,280	149	756	5.3	688.9	688.9	689.1	0.2
AI	33,720	350	1,645	2.4	690.3	690.3	690.6	0.3
AJ	33,910	470	2,845	1.4	692.7	692.7	692.7	0.0
AK	34,320	470	2,877	1.4	692.8	692.8	692.8	0.0
AL	34,890	231	745	5.4	692.6	692.6	692.8	0.2
AM	35,280	330	986	4.1	695.3	695.3	695.7	0.4
AN	35,500	234	789	5.1	696.4	696.4	697.0	0.6
AO	35,750	209	1,162	3.4	698.0	698.0	698.4	0.4
AP	36,000	200	954	4.2	698.7	698.7	699.0	0.3
AQ	37,430	290	1,305	3.1	700.9	700.9	701.5	0.6
AR	37,910	230	963	4.2	703.7	703.7	703.7	0.0
AS	38,190	300	960	4.2	704.7	704.7	705.3	0.6
AT	38,510	270	1,221	3.3	706.3	706.3	706.6	0.3
AU	39,700	90	530	4.4	709.2	709.2	709.3	0.1
AV	40,510	133	452	5.1	714.2	714.2	714.3	0.1

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

LITTLE HAIKEY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Watershed Unit 13 Little Haikey Creek (continued)								
AW	41,100[1]	225	655	3.5	716.7	716.7	717.2	0.5
AX	41,600[1]	139	651	3.6	718.6	718.6	719.3	0.7
AY	41,730[1]	107	555	4.2	719.9	719.9	720.3	0.4
AZ	42,350[1]	99	622	2.4	724.0	724.0	724.1	0.1
Little Haikey Creek Tributary								
A	386[2]	111	522	2.9	707.6	707.6	707.8	0.2
B	824[2]	99	364	4.2	708.4	708.4	708.5	0.1
C	1,219[2]	137	375	4.1	711.8	711.8	711.8	0.0
D	1,877[2]	110	511	3.0	716.3	716.3	716.6	0.3
E	2,472[2]	50	349	4.4	720.7	720.7	721.4	0.7
F	2,807[2]	43	159	9.7	721.1	721.1	721.1	0.0
Fry Ditch No. 2								
BP	25,900[1]	330	2,690	1.9	646.8	646.8	646.9	0.1
BQ	27,140[1]	260	1,470	3.5	647.4	647.4	647.6	0.2
BR	28,400[1]	210	1,230	4.2	649.3	649.3	650.0	0.7

[1] Feet above mouth

[2] Feet above confluence with Little Haikey Creek

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

FLOODWAY DATA

LITTLE HAIKEY CREEK – LITTLE HAIKEY CREEK TRIBUTARY – FRY DITCH NO. 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 13 Fry Ditch No. 2 (continued)								
CF	39,280	120	660	4.2	684.2	684.2	684.9	0.7
CG	40,000	330	1,520	1.8	685.7	685.7	686.1	0.4
CH	40,200	160	370	7.4	687.8	687.8	687.8	0.0
CI	40,690	60	350	7.8	695.5	695.5	695.5	0.0
CJ	41,760	200	1,340	1.5	698.0	698.0	699.0	1.0
CK	42,100	150	610	3.4	698.4	698.4	699.2	0.8
CL	43,180	100	470	4.4	703.0	703.0	703.1	0.1
CM	43,830	100	477	4.4	705.5	705.5	705.6	0.1
CN	44,560	100	590	2.8	707.2	707.2	707.4	0.2
CO	44,700	100	310	5.3	711.4	711.4	711.4	0.0
CP	45,470	100	700	2.3	712.4	712.4	712.9	0.5
CQ	46,260	90	440	3.7	717.5	717.5	717.5	0.0
CR	47,020	80	390	3.3	720.1	720.1	720.1	0.0
CS	47,800	90	340	3.7	723.2	723.2	723.2	0.0
CT	48,440	80	360	3.5	726.1	726.1	726.1	0.0

[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

FRY DITCH NO. 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Watershed Unit No. 13 Fry Ditch No. 2 (continued)								
BS	29,332	280	1,520	3.4	652.8	652.8	653.2	0.4
BT	29,960	370	1,540	3.3	653.7	653.7	654.3	0.6
BU	31,180	250	1,420	3.3	657.2	657.2	657.9	0.7
BV	32,360	160	870	5.4	659.7	659.7	660.6	0.9
BW	33,120	150	950	4.9	663.3	663.3	664.0	0.7
BX	33,260	200	1,370	3.4	664.0	664.0	664.8	0.8
BY	34,130	270	1,360	3.1	665.2	665.2	665.9	0.7
BZ	34,800	280	1,570	2.7	666.8	666.8	667.5	0.7
CA	35,700	200	740	4.6	669.6	669.6	670.1	0.5
CB	36,730	150	820	4.1	674.6	674.6	674.8	0.2
CC	37,480	180	800	4.2	676.8	676.8	677.2	0.4
CD	38,060	150	400	6.9	678.6	678.6	678.8	0.2
CE	38,420	160	820	3.3	683.0	683.0	683.1	0.1

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[1] Feet above mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

FRY DITCH NO. 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Watershed Unit No. 11 Vensel Creek Relocated								
A	800[1]	220	1,333	4.8	614.0	612.7[3]	612.7	0.0
B	2,400[1]	220	1,522	4.2	614.2	614.2	614.2	0.0
C	2,870[1]	100	266	17.9	628.0	628.0	628.0	0.0
D	3,670[1]	100	276	17.2	631.1	631.1	631.1	0.0
E	4,170[1]	70	319	12.7	635.4	635.4	635.4	0.0
F	4,470[1]	77	516	9.4	639.4	639.4	639.6	0.2
G	5,220[1]	86	672	5.8	646.1	646.1	646.2	0.1
H	5,870[1]	232	160	3.5	651.0	651.0	651.8	0.8
I	6,520[1]	200	278	7.3	654.5	654.5	655.1	0.6
J	7,670[1]	105	309	7.9	658.5	658.5	659.5	1.0
K	9,120[1]	58	228	10.1	668.1	668.1	669.0	0.9
L	11,220[1]	84	227	4.7	677.3	677.3	677.3	0.0
M	13,320[1]	109	375	1.6	707.5	707.5	707.5	0.0
N	14,820[1]	23	75	10.3	714.2	714.2	714.3	0.1
Tributary No. 1 to Vensel Creek Relocated								
A	400[2]	80	383	4.1	614.1	614.1	614.1	0.0
B	1,800[2]	80	386	4.1	616.2	616.2	616.2	0.0

[1] Feet above confluence with Arkansas River

[2] Feet above confluence with Vensel Creek Relocated

[3] Elevation computed without consideration of backwater from Arkansas River

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOODWAY DATA

VENSEL CREEK RELOCATED-TRIBUTARY NO. 1 TO VENSEL CREEK RELOCATED

5.0 INSURANCE APPLICATION

To establish actuarial insurance rates, data from the engineering study must be transformed into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail in the City of Tulsa.

5.1 Reach Determinations

Reaches are defined as sections of flood plain that have relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference may not have a variation greater than that indicated in the following tabulation for more than 20 percent of the reach:

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the flooding sources of the City of Tulsa are shown on the Flood Profiles (Exhibit 1) and summarized in Table 4.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is used to establish relationships between depth and frequency of flooding in any reach. This relationship is then used with depth-damage relationships for various classes of structures to establish actuarial insurance rate tables.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations rounded to the nearest one-half foot, multiplied by 10, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water-surface elevations is greater than 10.0 feet, it is rounded to the nearest whole foot.

5.3 Flood Insurance Zones

Flood insurance zones and zone numbers are assigned based on the type of flood hazard and the FHF, respectively. A unique zone number is

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3]
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit 1							
Arkansas River							
Reach 1	0025,0030, 0035,0060, 0085,0100	-5.2	-4.1	+11.6	050	A10	Varies
Shallow Flooding Sheet Flow	0060	*	*	*	*	AO	Average Depth 3 feet
Watershed Unit 2							
Bird Creek							
Reach 1	0015,0020	-4.9	-1.5	+ 3.1	050	A10	Varies
Reach 2	0010,0015	-2.9	-1.5	+ 2.5	030	A6	Varies
Watershed Unit 7							
Bird Creek Tributary							
Reach 1	0015	-2.3	-0.9	+ 1.5	025	A5	Varies

*Not computed for shallow flooding

[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

ARKANSAS RIVER-SHALLOW FLOODING
BIRD CREEK-BIRD CREEK TRIBUTARY

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit 7 (continued)							
Coal Creek (North Tulsa)							
Reach 1	0015	-1.3	-0.4	+ 0.5	015	A3	Varies
Reach 2	0015,0040	-3.1	-1.0	+ 1.6	030	A6	Varies
Reach 3	0040	-5.9	-1.6	+ 2.0	060	A12	Varies
Reach 4	0040	-2.1	-0.6	+ 1.1	020	A4	Varies
Coal Creek Tributary							
Reach 1	0040	-1.9	-0.7	+ 1.1	020	A4	Varies
Flat Rock Creek							
Reach 1	0010,0015	-7.5	-1.3	+ 2.2	075	A15	Varies
Reach 2	0010	-3.0	-1.7	+ 3.2	030	A6	Varies
Reach 3	0010	-4.6	-1.0	+ 2.4	045	A9	Varies

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[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

COAL CREEK (NORTH TULSA)-COAL CREEK TRIBUTARY-FLAT ROCK CREEK

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit 7 (continued)							
Flat Rock Creek Tributary A							
Reach 1	0010	-6.2	-1.1	+ 2.7	060	A12	Varies
Reach 2	0010	-2.9	-0.9	+ 3.5	030	A6	Varies
Dirty Butter Creek							
Reach 1	0010,0035	-2.3	-0.7	+ 1.7	025	A5	Varies
Shallow Flooding							
Sheet Flow	0035	*	*	*	*	A0	Average depth 2 feet
Dirty Butter Creek Tributary							
Reach 1	0010	-2.9	-0.7	+ 1.9	030	A6	Varies
Reach 2	0010	-6.6	-1.0	+ 2.0	065	A13	Varies
Reach 3	0010	-2.9	-0.8	+ 1.2	030	A6	Varies
Shallow Flooding							
Sheet Flow	0010,0035	*	*	*	*	A0	Average depth 2 feet

*Not computed for shallow flooding

[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

FLAT ROCK CREEK TRIBUTARY A-DIRTY BUTTER CREEK-DIRTY BUTTER CREEK TRIBUTARY

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit 7 (continued)							
Valley View Creek							
Reach 1	0010	-3.7	-1.2	+ 2.3	035	A7	Varies
Reach 2	0010	-3.0	-2.1	+ 7.3	030	A6	Varies
Watershed Unit 8							
Mingo Creek							
Reach 1	0020	-4.9	-1.0	+ 2.9	050	A10	Varies
Reach 2	0020,0040, 0045	-6.7	-1.4	+ 3.2	065	A13	Varies
Reach 3	0040,0045, 0065,0070	-3.2	-0.8	+ 1.7	030	A6	Varies
Reach 4	0070	-5.3	-1.6	+ 2.3	055	A11	Varies
Reach 5	0070	-3.0	-1.0	+ 1.6	030	A6	Varies
Reach 6	0065,0070	-1.5	-0.4	+ 0.9	015	A3	Varies
Douglas Creek							
Reach 1	0040,0045	-1.5	-0.4	+ 1.3	015	A3	Varies
Reach 2	0040,0045	-2.0	-0.4	+ 1.1	020	A4	Varies

[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

VALLEY VIEW CREEK-MINGO CREEK-DOUGLAS CREEK

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit 8 (continued)							
Mill Creek							
Reach 1	0040	-2.3	-0.6	+ 1.2	025	A5	Varies
Jones Creek							
Reach 1	0040	-2.0	-0.5	+ 1.1	020	A4	Varies
Audubon Creek							
Reach 1	0040,0065	-2.7	-0.6	+ 1.4	025	A5	Varies
Bell Creek							
Reach 1	0065,0070	-3.4	-0.9	+ 1.7	035	A7	Varies
Reach 2	0065	-1.0	-0.4	+ 1.2	010	A2	Varies
Bell Creek Tributary							
Reach 1	0065,0070	-1.3	-0.3	+ 0.7	015	A3	Varies
Reach 2	0065,0070	-2.4	-0.6	+ 0.9	025	A5	Varies

[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

MILL CREEK-JONES CREEK-AUDUBON CREEK-BELL CREEK-BELL CREEK TRIBUTARY

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit 8 (continued)							
Fulton Creek							
Reach 1	0065,0070	-2.2	-0.5	+ 1.2	020	A4	Varies
Alsuma Creek							
Reach 1	0070	-0.7	-0.2	+ 0.7	005	A1	Varies
Reach 2	0070	-1.9	-0.2	+ 0.5	020	A4	Varies
Little Creek							
Reach 1	0020	-2.0	-0.6	+ 2.0	020	A4	Varies
Reach 2	0020	-1.0	-0.3	+ 0.8	010	A2	Varies
Quarry Creek							
Reach 1	0020,0045	-1.3	-0.4	+ 0.9	015	A3	Varies
Eagle Creek							
Reach 1	0020,0045	-0.8	-0.3	+ 1.2	010	A2	Varies
Reach 2	0045	-7.4	-2.1	+ 0.7	075	A15	Varies
Reach 3	0045	-3.4	-1.7	+ 0.7	035	A7	Varies

[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

FULTON CREEK ALSUMA CREEK LITTLE CREEK-QUARRY CREEK-EAGLE CREEK

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit 8 (continued)							
Eagle Creek (continued)							
Reach 4	0045	-1.2	-0.4	+ 0.7	010	A2	Varies
Reach 5	0045	-1.3	-0.3	+ 0.6	015	A3	Varies
Cooley Creek							
Reach 1	0045	-3.6	-1.2	+ 2.1	035	A7	Varies
Reach 2	0045	-4.4	-2.4	+ 2.3	045	A9	Varies
Reach 3	0045	-2.2	-0.6	+ 1.5	020	A4	Varies
Reach 4	0045	-6.1	-2.9	+ 3.9	060	A12	Varies
Reach 5	0045	-1.3	-0.4	+ 0.7	015	A3	Varies

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[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

EAGLE CREEK-COOLEY CREEK

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND 10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)	FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
Watershed Unit 8 (continued)							
Cooley Creek Tributary							
Reach 1	0045	-2.1	-0.6	+ 1.2	020	A4	Varies
Reach 2	0045	-3.3	-1.3	+ 3.0	035	A7	Varies
Reach 3	0045,0050	-1.3	-0.4	+ 1.0	015	A3	Varies
Reach 4	0050	-2.0	-0.5	+ 1.5	020	A4	Varies
Tupelo Creek							
Reach 1	0045	-2.2	-0.6	+ 1.2	020	A4	Varies
Tupelo Creek Tributary							
Reach 1	0045	-1.1	-0.3	+ 0.9	010	A2	Varies

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[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

COOLEY CREEK TRIBUTARY - TUPELO CREEK - TUPELO CREEK TRIBUTARY

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit 8 (continued)							
Brookhollow Creek							
Reach 1	0070	-2.9	-0.7	+ 1.5	030	A6	Varies
Reach 2	0045,0070	-2.0	-0.5	+ 1.1	020	A4	Varies
Brookhollow Creek Tributary							
Reach 1	0070	-2.9	-0.6	+ 1.2	030	A6	Varies
Reach 2	0070	-1.5	-0.3	+ 0.8	015	A3	Varies
Sugar Creek							
Reach 1	0070	-3.9	-1.0	+ 2.3	040	A8	Varies
Reach 2	0070	-1.3	-0.3	+ 0.8	015	A3	Varies

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[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT-SEE MAP

BEST COPY AVAILABLE

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

BROOKHOLLOW CREEK - BROOKHOLLOW CREEK TRIBUTARY-SUGAR CREEK

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND 10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)	FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
Watershed Unit 8 (continuted)							
Southpark Creek							
Reach 1	0070	-4.7	-2.0	+ 1.3	045	A9	Varies
Reach 2	0070	-1.0	-0.3	+ 0.7	010	A2	Varies
Ford Creek							
Reach 1	0070	-1.4	-0.5	+ 1.3	015	A3	Varies
Reach 2	0070	-2.2	-0.5	+ 0.8	020	A4	Varies
Reach 3	0070	-1.5	-0.4	+ 0.9	015	A3	Varies
Catfish Creek							
Reach 1	0070	-2.2	-0.6	+ 1.2	020	A4	Varies
Reach 2	0070	-0.9	-0.2	+ 0.6	010	A2	Varies
Watershed Unit 9							
Spunky Creek							
Tributary A							
Reach 1	0050	-1.2	-0.5	+ 0.6	010	A2	Varies

[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

SOUTHPARK CREEK-FORD CREEK-CATFISH CREEK-SPUNKY CREEK TRIBUTARY A

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit 9 (continued)							
Spunky Creek Tributary B							
Reach 1	0050	-4.1	-0.6	+ 0.9	040	A8	Varies
Reach 2	0050	-1.5	-0.2	+ 0.5	015	A3	Varies
Spunky Creek Tributary B-1							
Reach 1	0050	-1.0	-0.1	+ 0.3	010	A2	Varies

[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

SPUNKY CREEK TRIBUTARY B-SPUNKY CREEK TRIBUTARY B-1

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit 10							
Harlow Creek							
Reach 1	0030	-8.5	-2.6	+0.4	085	A17	Varies
Reach 2	0030	-6.5	-3.2	+1.6	065	A13	Varies
Reach 3	0030	-2.8	-2.9	+2.7	030	A6	Varies
Harlow Creek Tributary							
Reach 1	0025,0030	-2.5	-1.2	+1.6	025	A5	Varies
Blackboy Creek							
Reach 1	0025	-12.9	-3.1	+1.0	130	A23	Varies
Reach 2	*	-7.1	-3.0	+1.2	070	A14	Varies
Reach 3	0025	-4.2	-2.4	+1.6	040	A8	Varies

*Located outside corporate limits.

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[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

HARLOW CREEK - HARLOW CREEK TRIBUTARY-BLACKBOY CREEK

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit No. 11							
Vensel Creek							
Reach 1	85	-1.7	-0.5	+2.5	015	A3	Varies
Reach 2	85	-0.9	-0.1	+0.5	010	A2	Varies
Fred Creek							
Reach 1	85,90	-2.8	-0.8	+1.2	030	A6	Varies
Joe Creek							
Reach 1	60,85	-5.1	-1.5	+5.8	050	A10	Varies

[1] Flood Insurance Rate Map Panel

[2] Weighted Average

[3] Rounded to the nearest foot - see map

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

VENSEL CREEK-FRED CREEK-JOE CREEK

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit 11 (continued)							
South Fork Joe Creek							
Reach 1	0060,0065	-2.7	-0.6	+ 1.4	025	A5	Varies
Little Joe Creek							
Reach 1	0060,0065	-3.8	-0.8	+ 2.0	040	A8	Varies
Reach 2	0065	-1.2	-0.3	+ 0.8	010	A2	Varies
Reach 3	0065	-5.0	-1.3	+ 1.7	050	A10	Varies
South Fork Little Joe Creek							
Reach 1	0065	-3.9	-0.8	+ 1.5	040	A8	Varies
Reach 2	0065	-2.0	-0.6	+ 1.4	020	A4	Varies
Reach 3	0065	-1.0	-0.3	+ 0.5	010	A2	Varies

[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

SOUTH FORK JOE CREEK- LITTLE JOE CREEK- SOUTH FORK LITTLE JOE CREEK

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit 11 (continued)							
North Fork Little Joe Creek							
Reach 1	0065	-1.7	-4.0	+ 2.4	015	A3	Varies
Reach 2	0065	-5.5	-3.0	+ 2.5	055	A11	Varies
Reach 3	0065	-2.1	-2.2	+ 2.2	020	A4	Varies
Reach 4	0065	-0.9	-0.5	+ 1.0	010	A2	Varies
East Branch Joe Creek							
Reach 1	0060	-1.1	-0.6	+ 1.1	010	A2	Varies
Reach 2	0060,0065	-5.5	-0.9	+ 1.7	055	A11	Varies
Reach 3	0065	-2.7	-0.6	+ 1.2	025	A5	Varies
Reach 4	0065	-1.5	-0.8	+ 1.1	015	A3	Varies
West Branch Joe Creek							
Reach 1	0060	-4.4	-0.7	+ 1.3	045	A9	Varies
Reach 2	0060	-7.1	-0.9	+ 2.0	070	A14	Varies
Reach 3	0060	-5.0	-0.9	+ 1.9	050	A10	Varies

[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

NORTH FORK LITTLE JOE CREEK-EAST BRANCH JOE CREEK-WEST BRANCH JOE CREEK

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit 11 (continued)							
Crow Creek							
Reach 1	0060	-5.5	-1.5	+ 4.5	055	A11	Varies
Reach 2	0035,0060	-3.6	-1.0	+ 2.1	035	A7	Varies
Watershed Unit 12							
Hager Creek							
Reach 1	0085	-4.0	-1.4	+ 1.9	040	A8	Varies
Reach 2	0085	-1.0	-0.8	+ 0.8	010	A2	Varies
Reach 3	0085	-2.1	-0.7	+ 1.1	020	A4	Varies
Mooser Creek							
Reach 1	0055,0060	-4.6	-1.2	+ 4.1	045	A9	Varies
Reach 2	0055	-2.3	-0.7	+ 4.1	025	A5	Varies
Mooser Creek Tributary							
Reach 1	0055	-2.4	-0.6	+ 1.3	025	A5	Varies

[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT-SEE MAP

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TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

CROW CREEK-HAGER CREEK-MOOSER CREEK-MOOSER CREEK TRIBUTARY

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit 12 (continued)							
Cherry Creek (West Tulsa)							
Reach 1	0055,0060	-3.4	-1.4	+ 9.0	035	A7	Varies
Reach 2	0055,0060	-2.0	-1.0	+ 7.0	020	A4	Varies
Red Fork Creek							
Reach 1	0055	-7.1	-2.3	+ 7.4	070	A14	Varies
Reach 2	0055	-2.4	-0.9	+ 2.4	025	A5	Varies
Nickel Creek							
Reach 1	0080	-2.2	-0.6	+ 1.3	020	A4	Varies
Watershed Unit 13							
Haikey Creek							
Reach 1	0095	-3.2	-0.8	+ 1.7	030	A6	Varies
Reach 2	0070	-1.5	-0.3	+ 0.7	015	A3	Varies

[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

CHERRY CREEK(WEST TULSA)-RED FORK CREEK-NICKEL CREEK-HAIKEY CREEK

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit 13 (continued)							
West Branch Haikey Creek Reach 1	95	-2.2	-0.6	+1.2	020	A4	Varies
Little Haikey Creek Reach 1	90,95	-2.2	-0.7	+1.5	020	A4	Varies
Little Haikey Creek Tributary Reach 1	90	-1.7	-0.5	+1.1	015	A3	Varies

[1] Flood Insurance Rate Map Panel

[2] Weighted Average

[3] Rounded to the nearest foot - see map

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

WEST BRANCH HAIKEY CREEK-LITTLE HAIKEY CREEK - AND LITTLE HAIKEY CREEK TRIBUTARY

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit 13 (continued)							
Fry Ditch No. 2							
Shallow Flooding Sheet Flow	100	*	*	*	*	AO	Average Depth 2 Feet
Reach 1	90	-2.7	-1.0	+1.6	025	A5	Varies

[1] Flood Insurance Rate Map Panel

[2] Weighted Average

[3] Rounded to the nearest foot - see map

*Not computed for shallow flooding

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

FRY DITCH NO. 2 AND SHALLOW FLOODING

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Watershed Unit No. 11							
Vensel Creek Relocated							
Reach 1	85	-1.3	-0.4	+0.8	015	A3	Varies
Reach 2	85,90	-2.1	-0.4	+0.3	020	A4	Varies
Reach 3	90	-1.5	-0.2	+0.4	015	A3	Varies
Reach 4	90	-3.6	-0.5	+0.1	035	A7	Varies
Reach 5	90	-2.0	-0.4	+0.5	020	A4	Varies
Tributary No. 1 to Vensel Creek Relocated							
Reach 1	85	-1.3	-0.4	+1.0	015	A3	Varies

[1] Flood Insurance Rate Map Panel

[2] Weighted Average

[3] Rounded to the nearest foot - see map

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TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

FLOOD INSURANCE ZONE DATA

VENSEL CREEK RELOCATED-TRIBUTARY NO. 1 TO VENSEL CREEK RELOCATED

associated with each possible FHF, and varies from 1 for a FHF of 005 to a maximum of 30 for a FHF of 200 or greater.

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.
Zone AO:	Special Flood Hazard Areas inundated by types of 100-year shallow flooding where depths are between 1.0 and 3.0 feet; depths are shown but no FHFs are determined.
Zones A1-A15, A17, and A23:	Special Flood Hazard Areas inundated by the 100-year flood; with base flood elevations shown, and zones subdivided according to FHFs.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood; areas that are protected from the 100- or 500-year floods by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding; not subdivided.

Flood elevation differences, FHFs, flood insurance zones, and base flood elevations for the flooding sources studied in detail in the community are shown in Table 4.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Tulsa is, for insurance purposes, the principal result of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevations. Base flood elevation lines show the locations of the expected whole-foot water-surface elevation of the base (100-year) flood. The base flood elevations and zone numbers are used by insurance agents, in conjunction with structure elevations and characteristics, to assign actuarial insurance rates to structures and contents insured under the National Flood Insurance Program.

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6.0 OTHER STUDIES

Detailed studies were performed by the COE on Cherry Creek and Red Fork Creek in West Tulsa for a report entitled "Detailed Project Report" (DPR) (Reference 7). The report investigated the feasibility of providing flood protection for areas along the streams. The project is designed to protect against a flood equal to the flood of record of September 3, 1940. The September 1940 flood flow of 4,200 cfs (below the confluence of Red Fork Creek) was estimated to be a 25-year flood in the DPR study. However, 4,200 cfs is now estimated to be between a 10- and 50-year flood.

The COE also performed detailed studies for Flat Rock Creek and Valley View Creek in another DPR (Reference 8). The report investigated possible flood control measures and showed a 100-year design channel to be economically feasible. The Flat Rock Creek 100-year flood flow of 11,600 cfs (at Peoria Avenue) in the DPR is approximately 25 percent below that shown in this study. This difference is attributed to more refined methods of determining the various flood flows and because of updated hydrologic data.

In March 1970, the COE published a Flood Plain Information report for the main stem of Mingo Creek (Reference 9). The report showed flows and backwater profiles for the 100-year flood and Standard Project Flood, as well as photographs of historic and possible future flooding. Mingo Creek 100-year discharges presented in the report are approximately 55 percent lower than those in this study. The higher discharges, more detailed topographic and historic flood information, and an increase of urbanization in the basin results in the 100-year profile in this study being an average of approximately 3 feet higher than the 100-year profile in the COE report.

The COE published a Special Flood Hazard Information report for Tulsa in October 1970 that showed the 100-year and Standard Project Flood water-surface profiles for the Arkansas River, Joe Creek, Little Joe Creek, South Fork Little Joe Creek, Mingo Creek, Flat Rock Creek, Valley View Creek, Cherry Creek, and Red Fork Creek (Reference 10).

In June 1971, the COE prepared the Tulsa Type 10 Flood Insurance Study, under agreement with FEMA (Reference 11). Profiles and flooding information were developed for the Arkansas River, Bird Creek, Flat Rock Creek, Valley View Creek, Mingo Creek, Joe Creek, Little Joe Creek, South Fork Little Joe Creek, Cherry Creek, and Red Fork Creek. The flooding information developed in the 1971 study was based on limited survey data, 10-foot contour interval topographic maps, and limited hydrologic and hydraulic data. Because of the more detailed 2-foot contour interval topographic data, increases in urbanization, and more detailed hydrologic data, this study supercedes the 1971 study.

A Flood Plain Information report for Haikey Creek and tributaries was published by the COE in September 1973 (Reference 12). The COE report presented the 100-year and Standard Project Flood profiles and also showed the approximate limits of the flood boundaries. The 100-year discharges computed in this study for Haikey Creek and its tributaries average from 1 to 3 feet higher at most points than those computed in the COE report. The major reason in the differences is the increased amount of urbanization that has occurred in the watershed. Also, better topographic data were available for this study which resulted in a more detailed hydrologic model of the basin. The difference in 100-year flood elevations shown in this study and those shown in the COE report can be attributed to the differences in discharges and to the development of detailed topographic data. The detailed topographic data allowed the addition of cross sections at numerous points to increase the accuracy of the backwater computations. Also, channel realignment in several stream reaches has changed flood elevations.

An Interim Special Flood Hazard Information report was published by the COE in April 1977 for Bird Creek from its mouth to Sperry, Oklahoma (Reference 13). The report presented high-water profiles and photographs for many streams in the Tulsa area, including Mingo Creek, Joe Creek, Little Joe Creek, Fred Creek, Haikey Creek, and Fry Ditch No. 2. Flooded area maps were also included in the report.

In December 1977, the COE published a report on the May 30, 1976, flood in the Tulsa area (Reference 14). The report presented high-water profiles and photographs for many streams, including Mingo Creek, Joe Creek, Little Joe Creek, Fred Creek, Haikey Creek, and Fry Ditch No. 2. Flooded area maps were also included in this report.

The watersheds analyzed in this study were included in preliminary reports for the Tulsa Metropolitan Area Urban Study prepared by the COE (Reference 15). The reports were prepared to develop plans which, if implemented, could be used to help solve the urban problems associated with water and related land resources.

7.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, Regional Director, Region VI, Federal Center, Denton, Texas 76201.

8.0 BIBLIOGRAPHY AND REFERENCES

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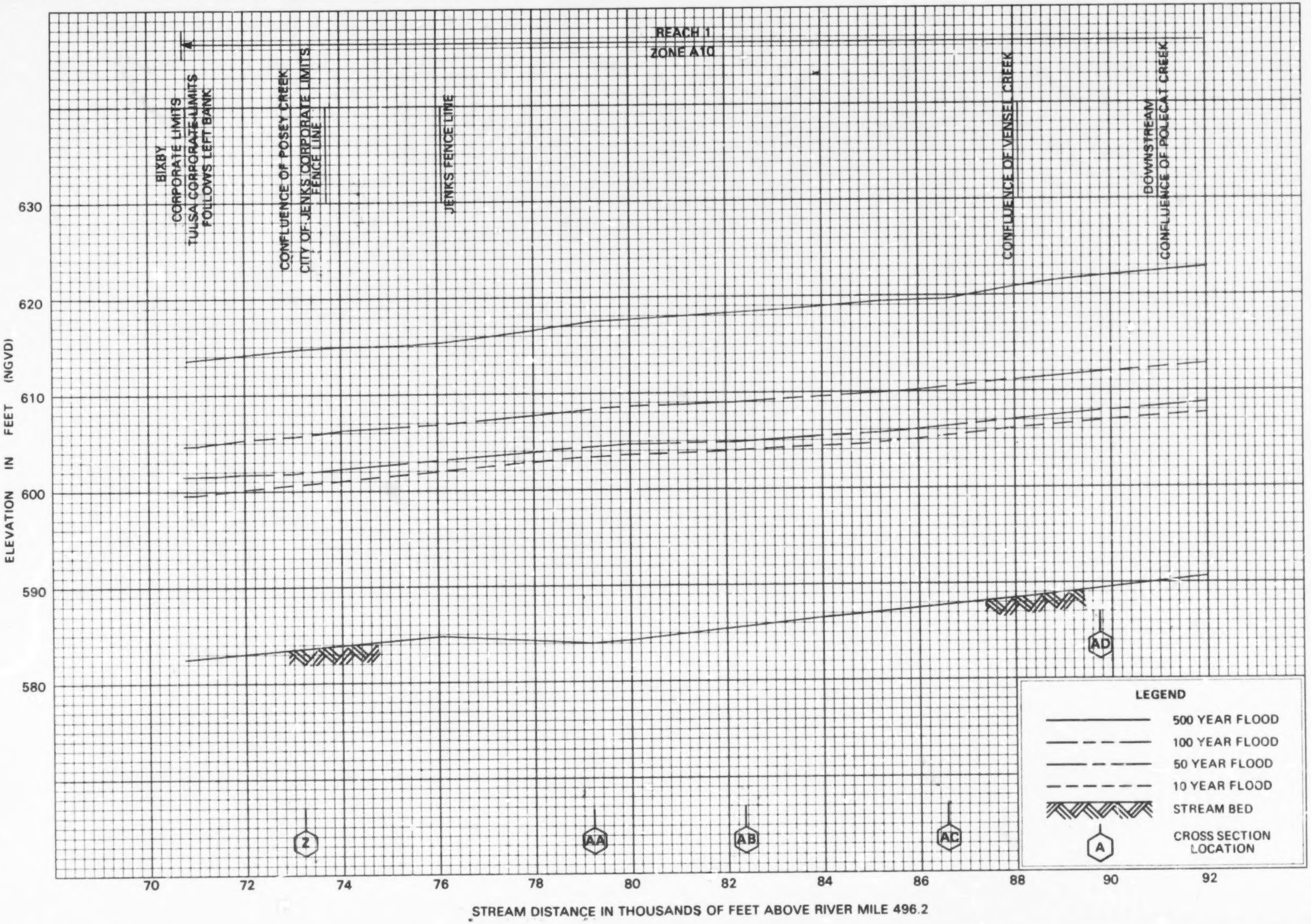

FLOOD PROFILES

ARKANSAS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

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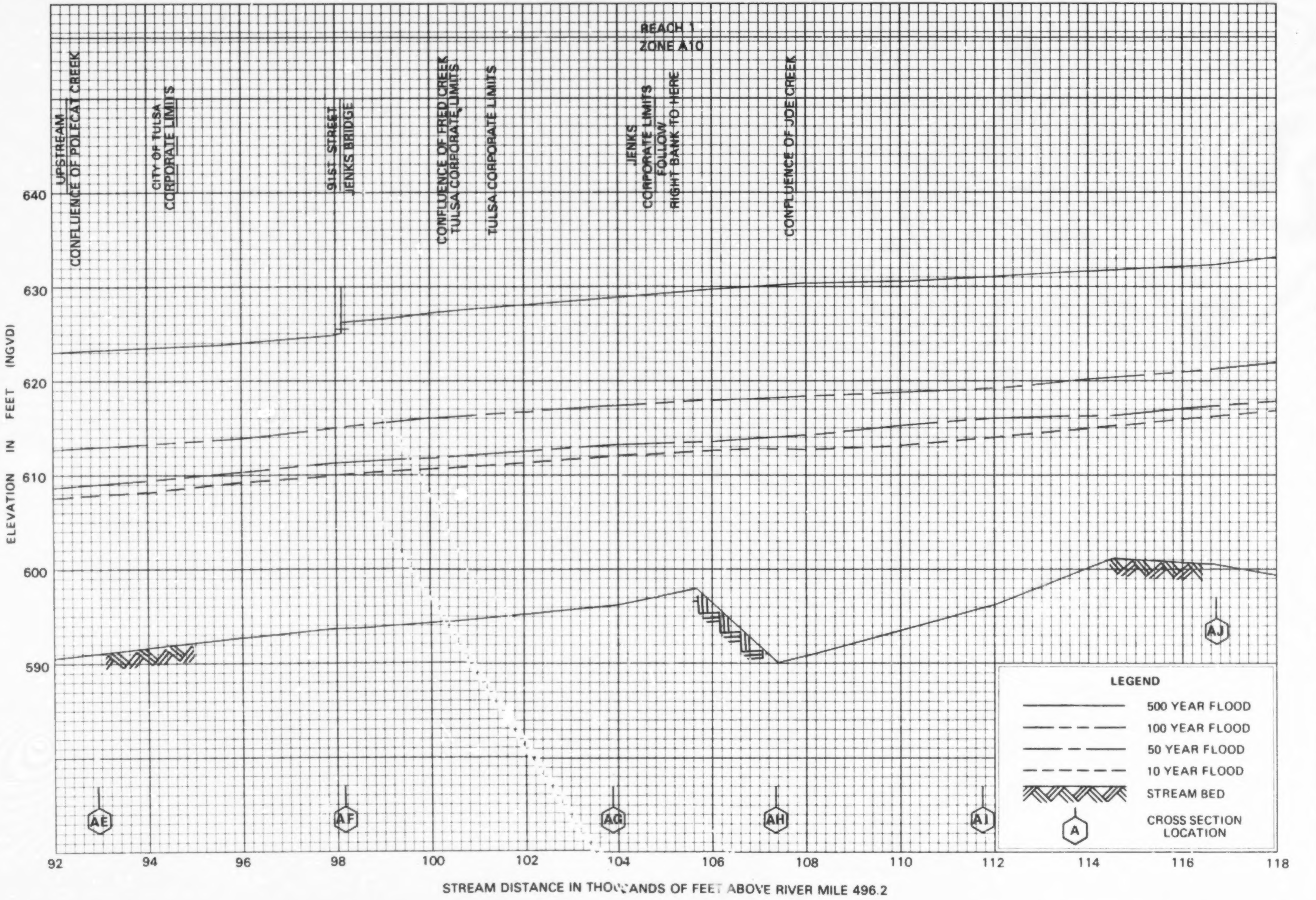

FLOOD PROFILES

ARKANSAS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

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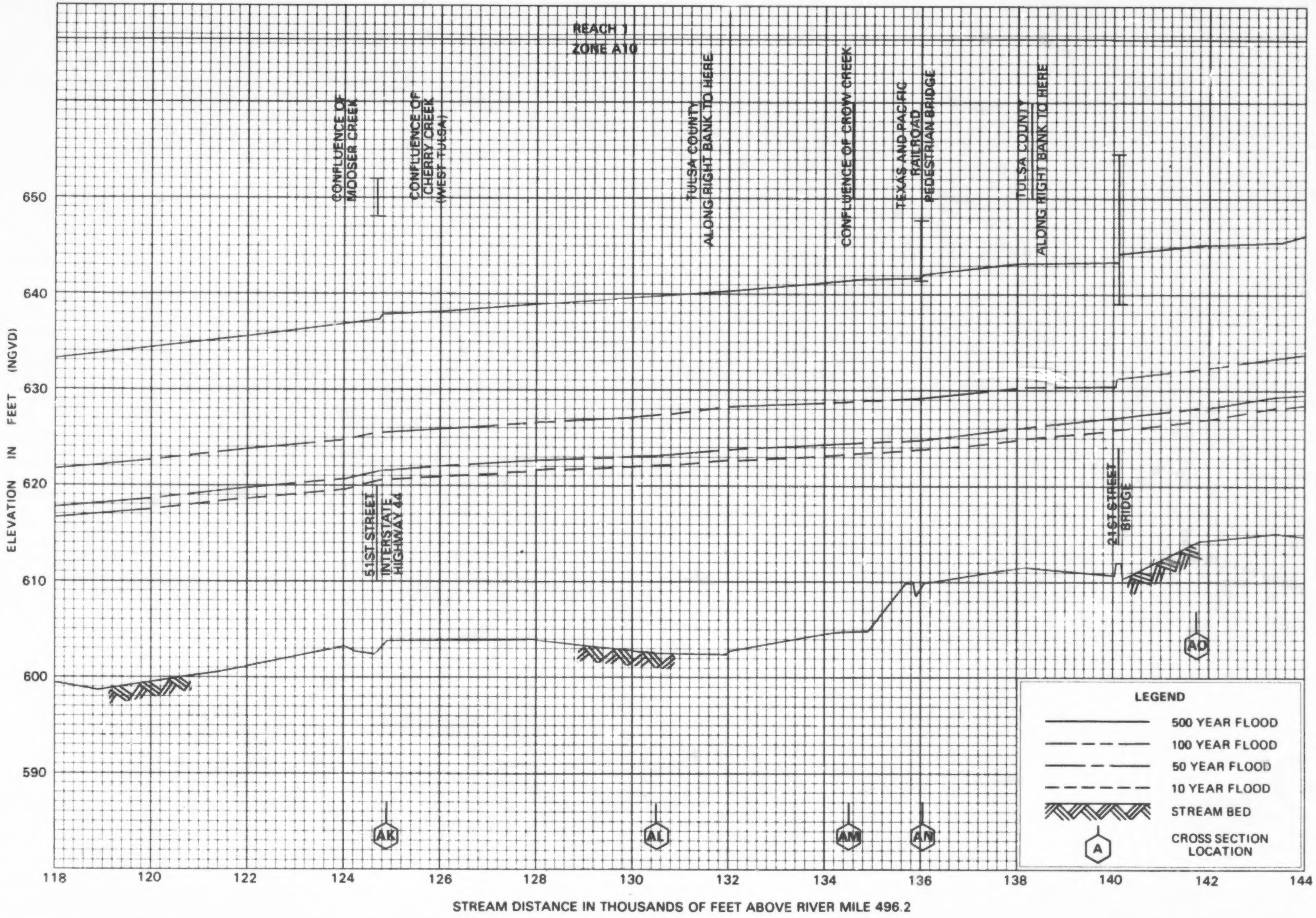
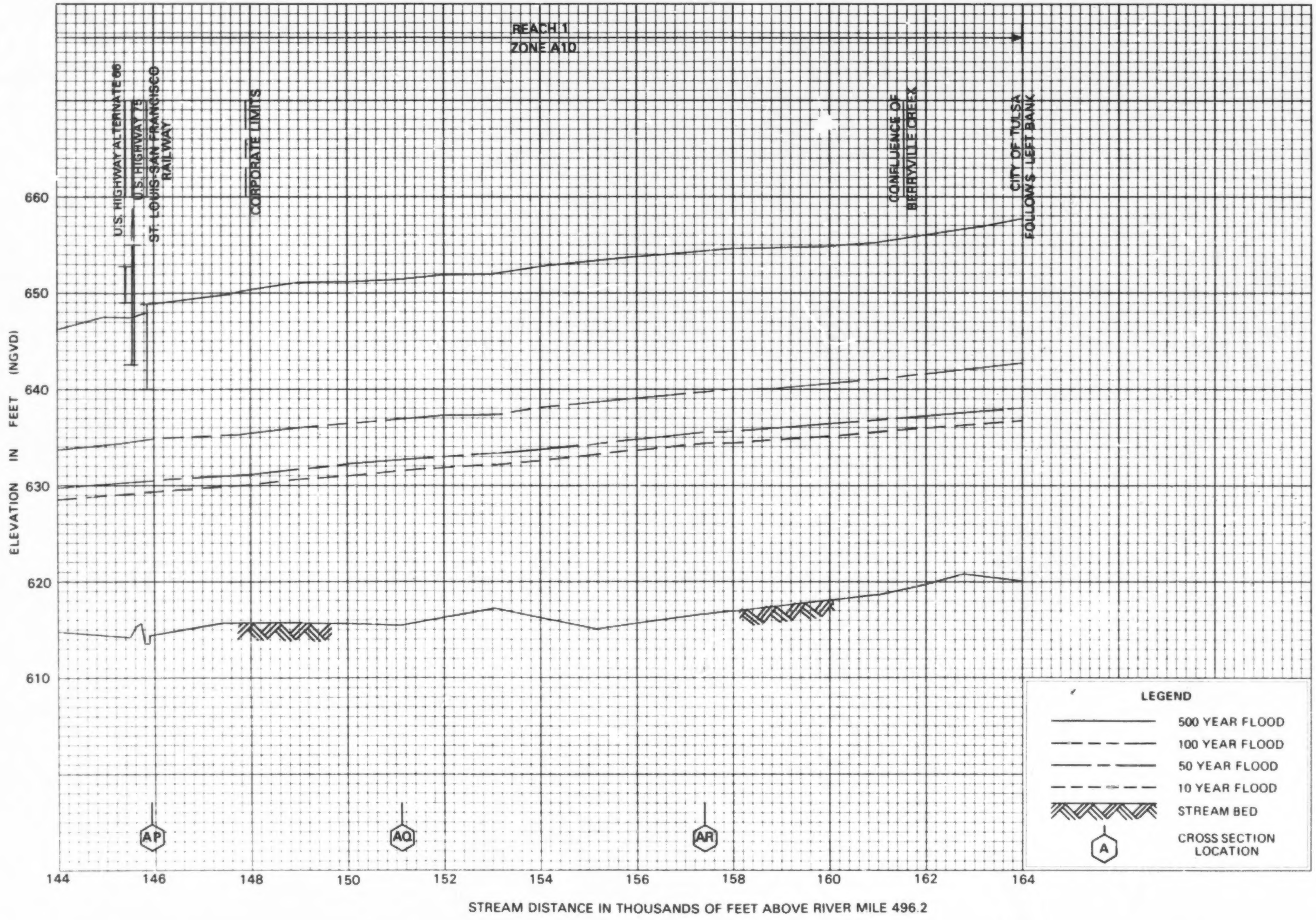


FLOOD PROFILES

ARKANSAS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)



FLOOD PROFILES

ARKANSAS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

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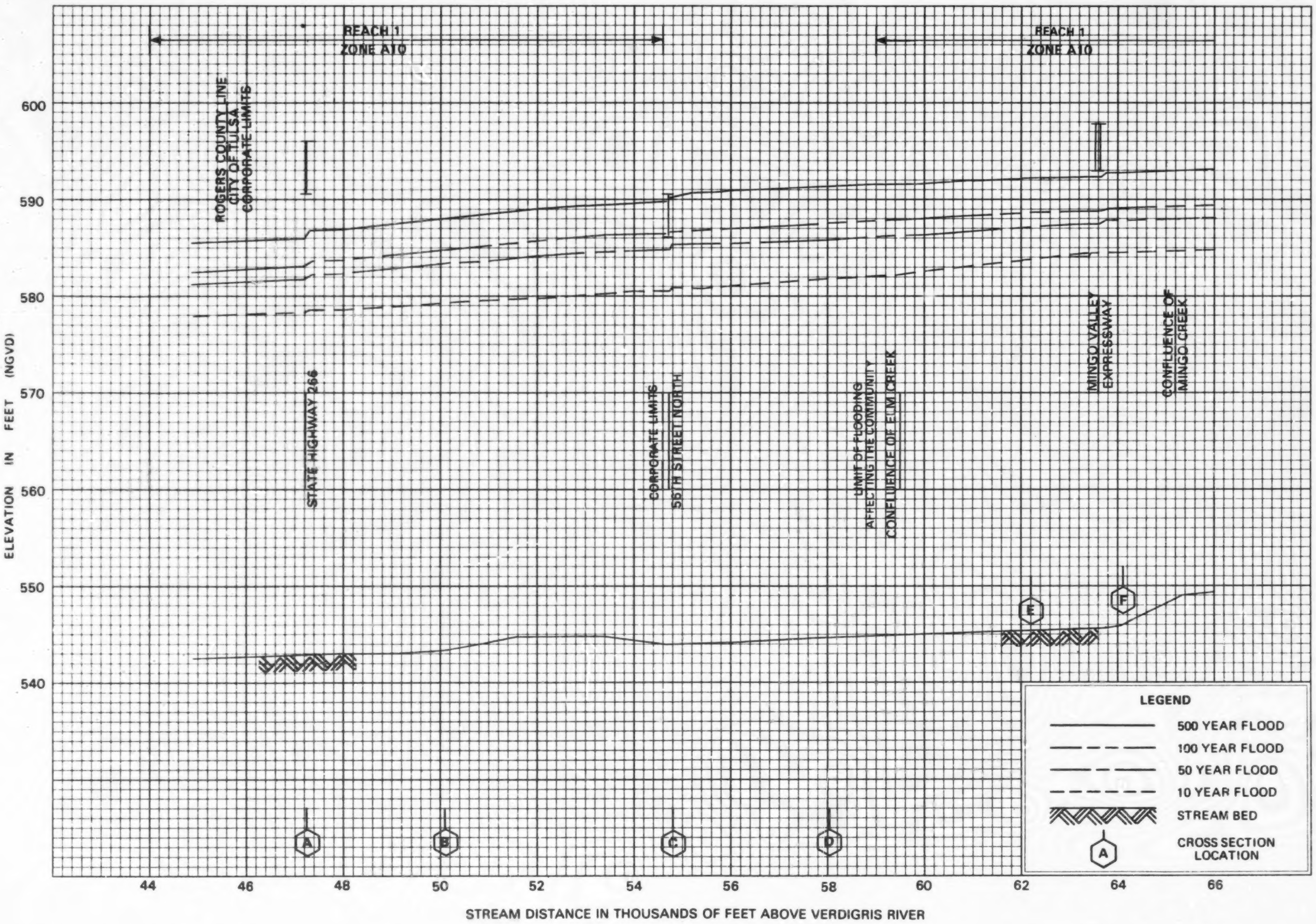


FLOOD PROFILES

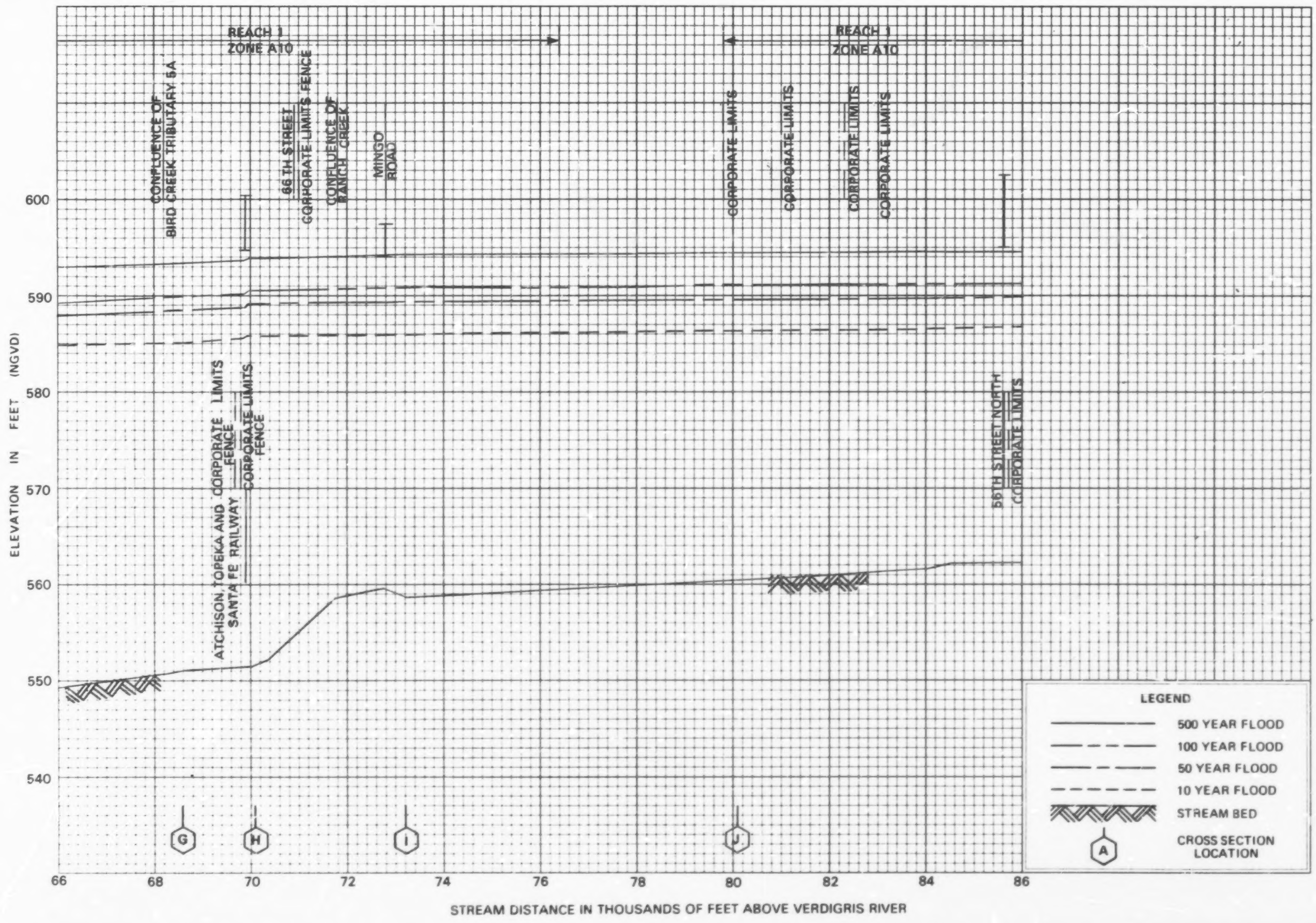
BIRD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

05P



FLOOD PROFILES

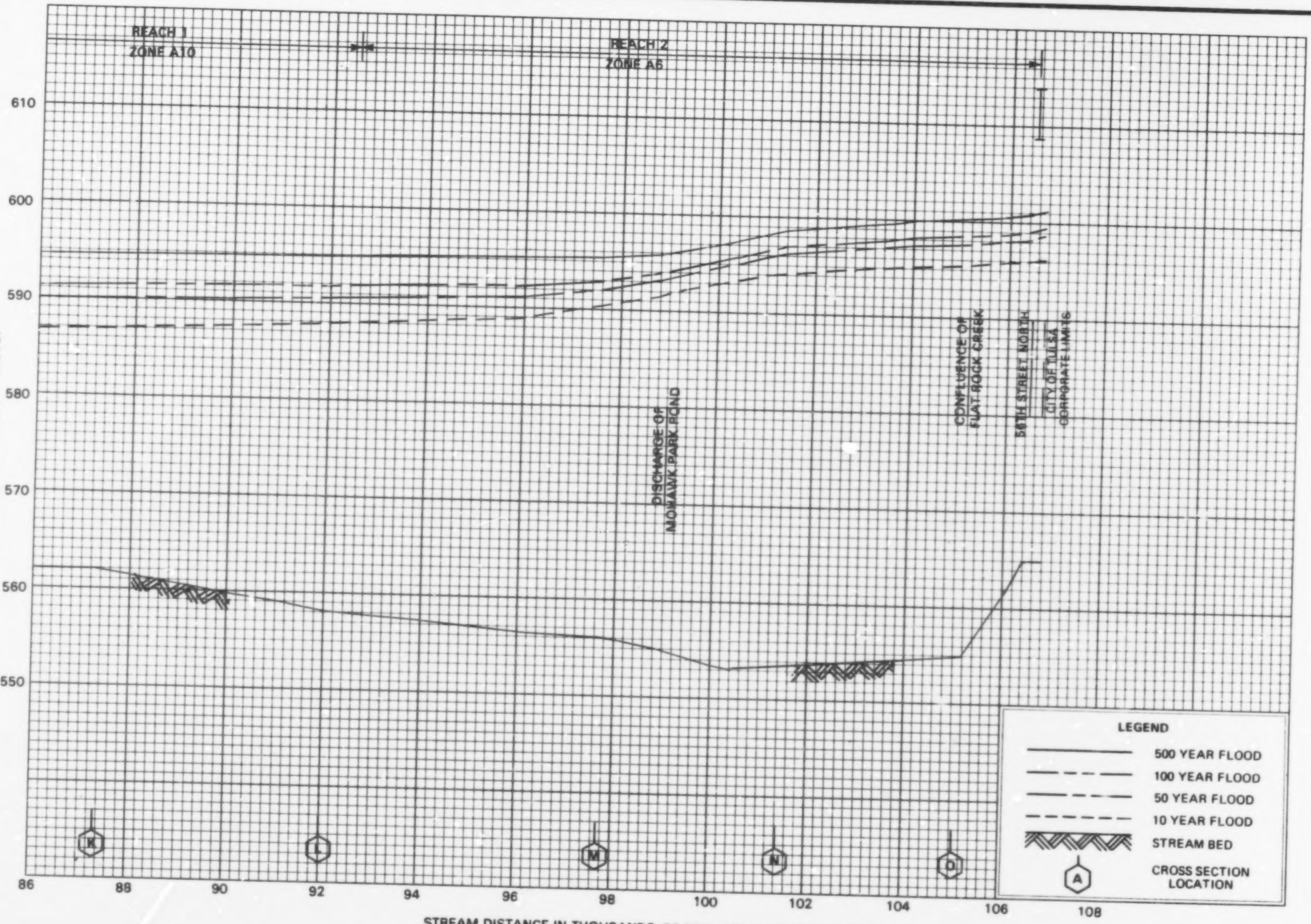
BIRD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

06P

101



FLOOD PROFILES

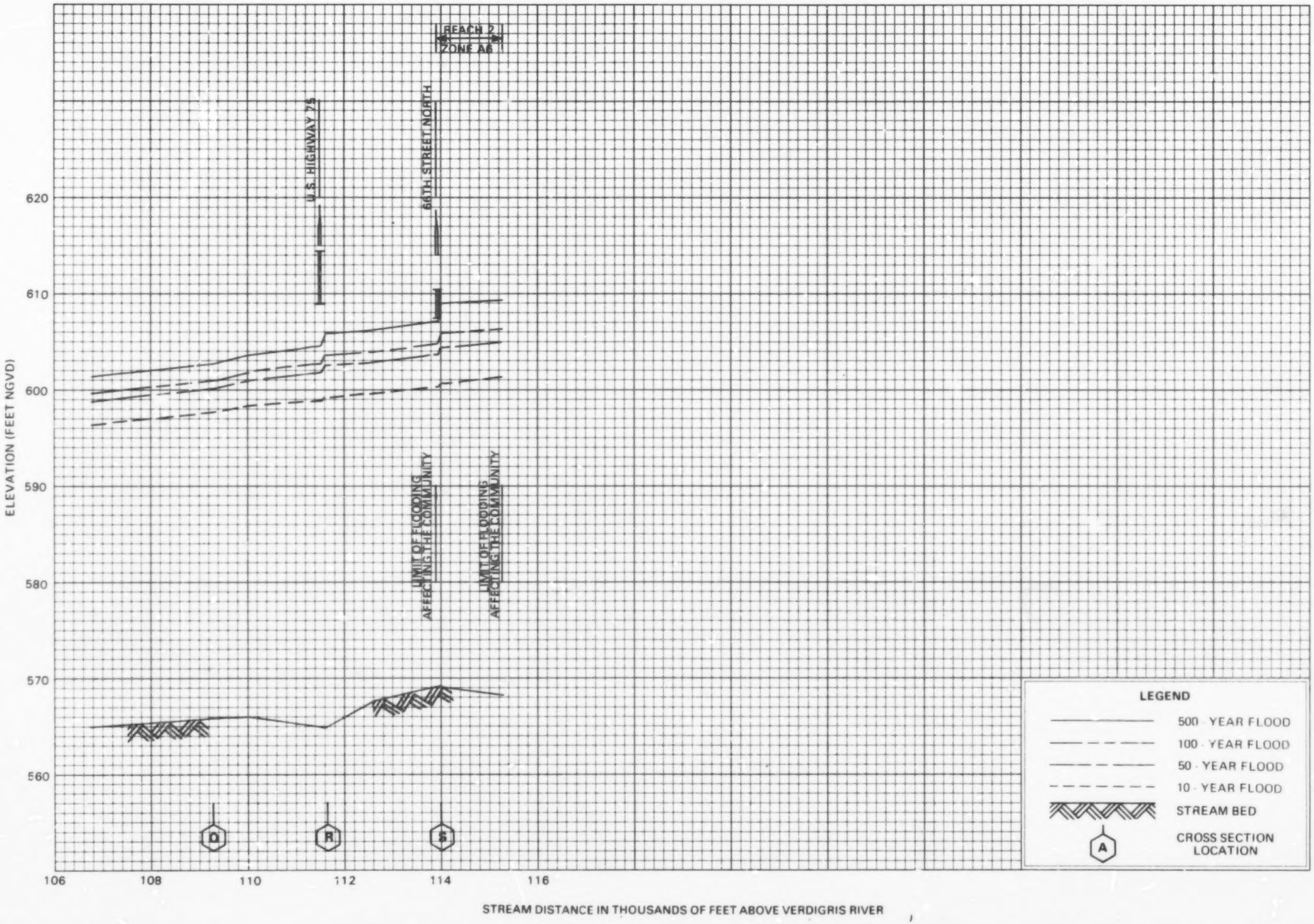
BIRD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

07P



FLOOD PROFILES

BIRD CREEK

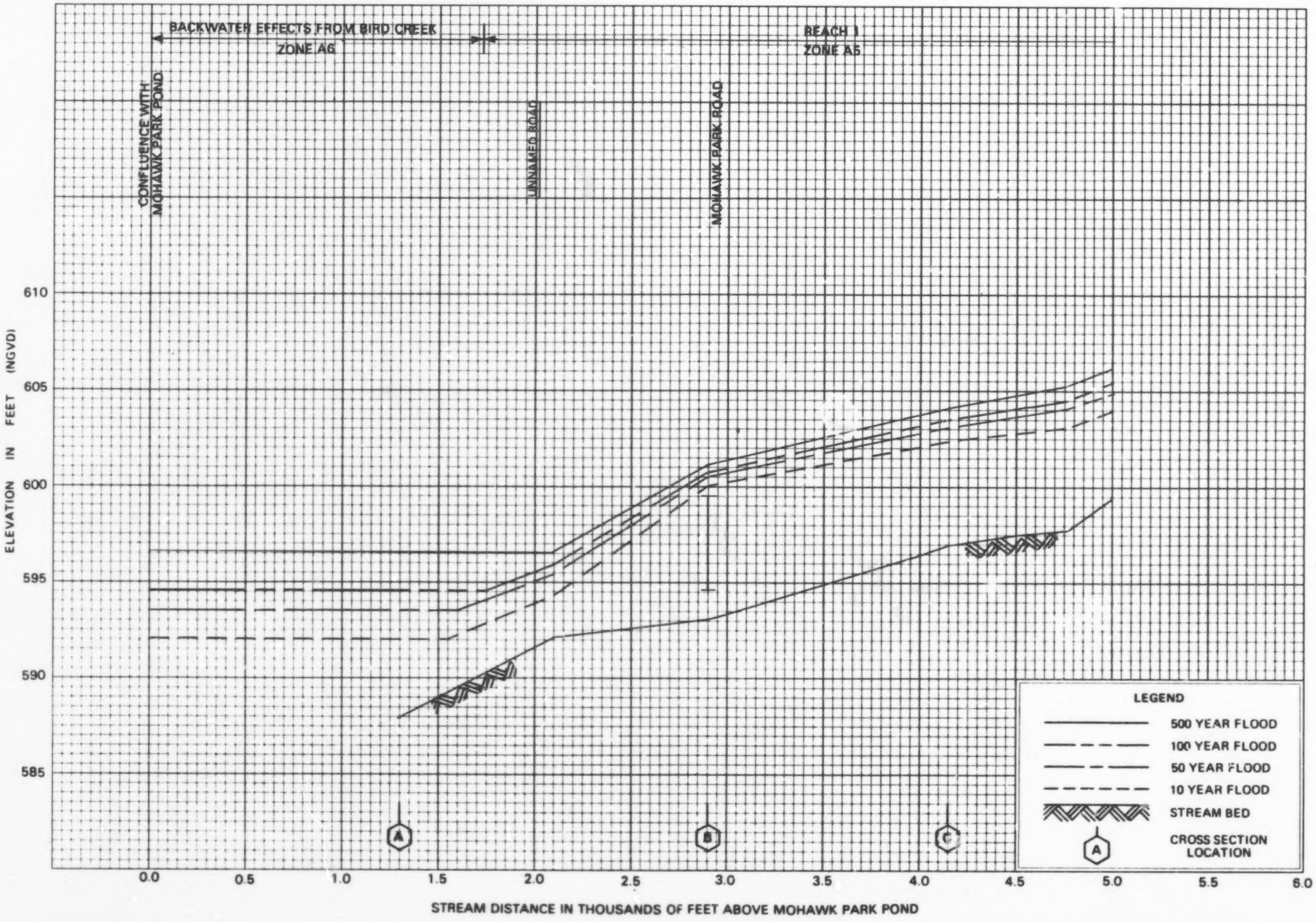
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

08P

103



FLOOD PROFILES

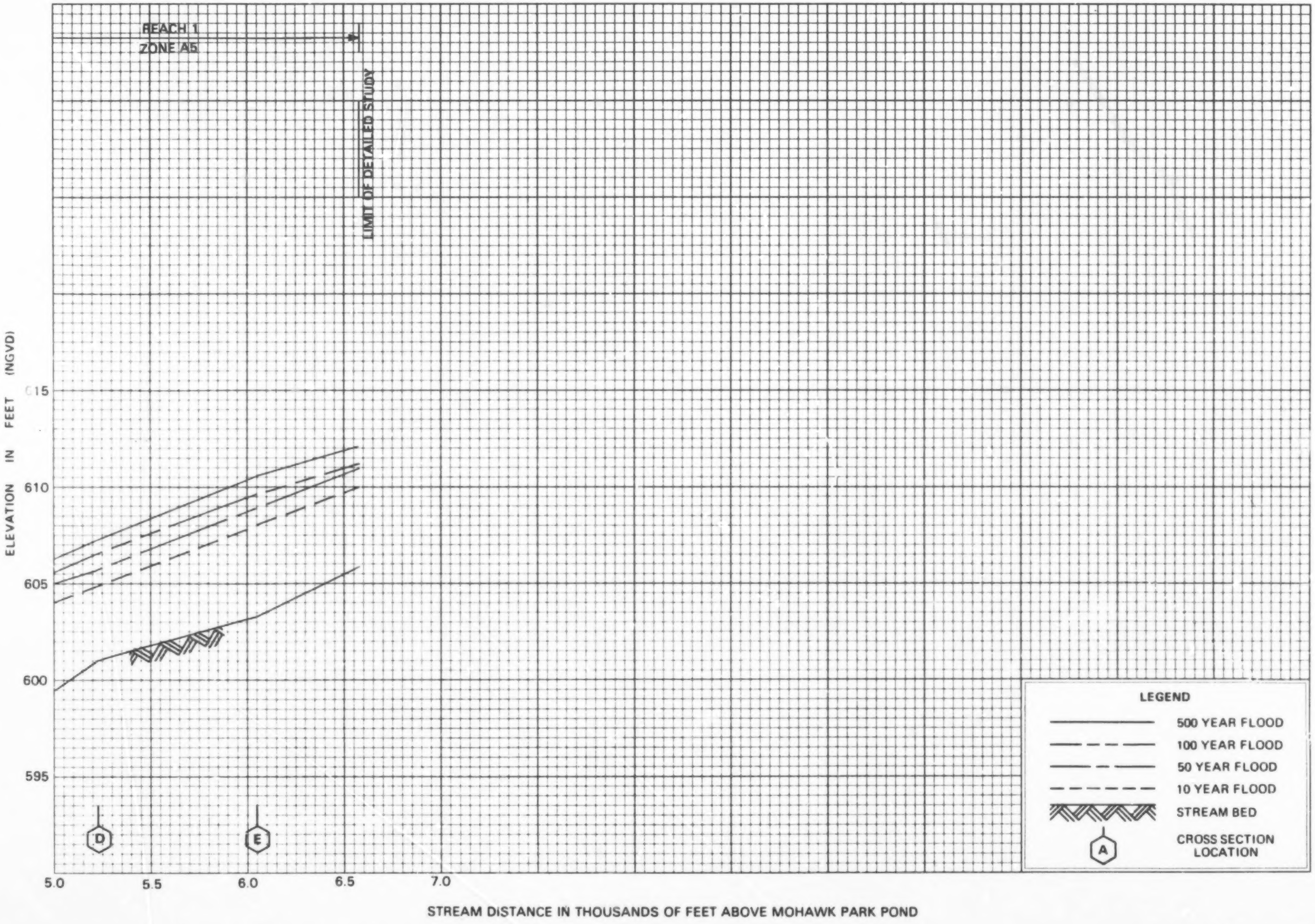
BIRD CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

09P

104



FLOOD PROFILES

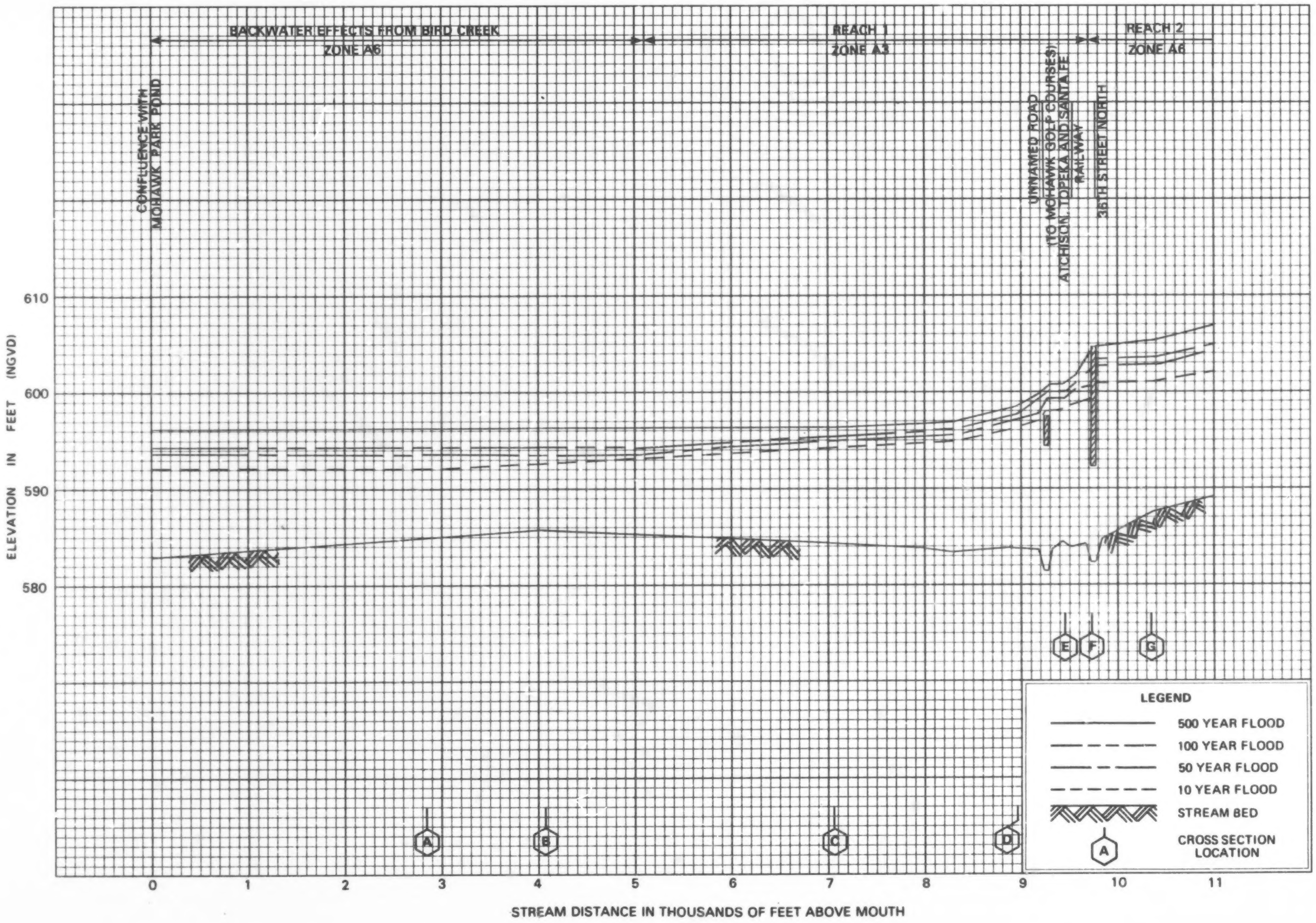
BIRD CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE AND ROGERS COS.)

10P



FLOOD PROFILES

COAL CREEK (NORTH TULSA)

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

11P

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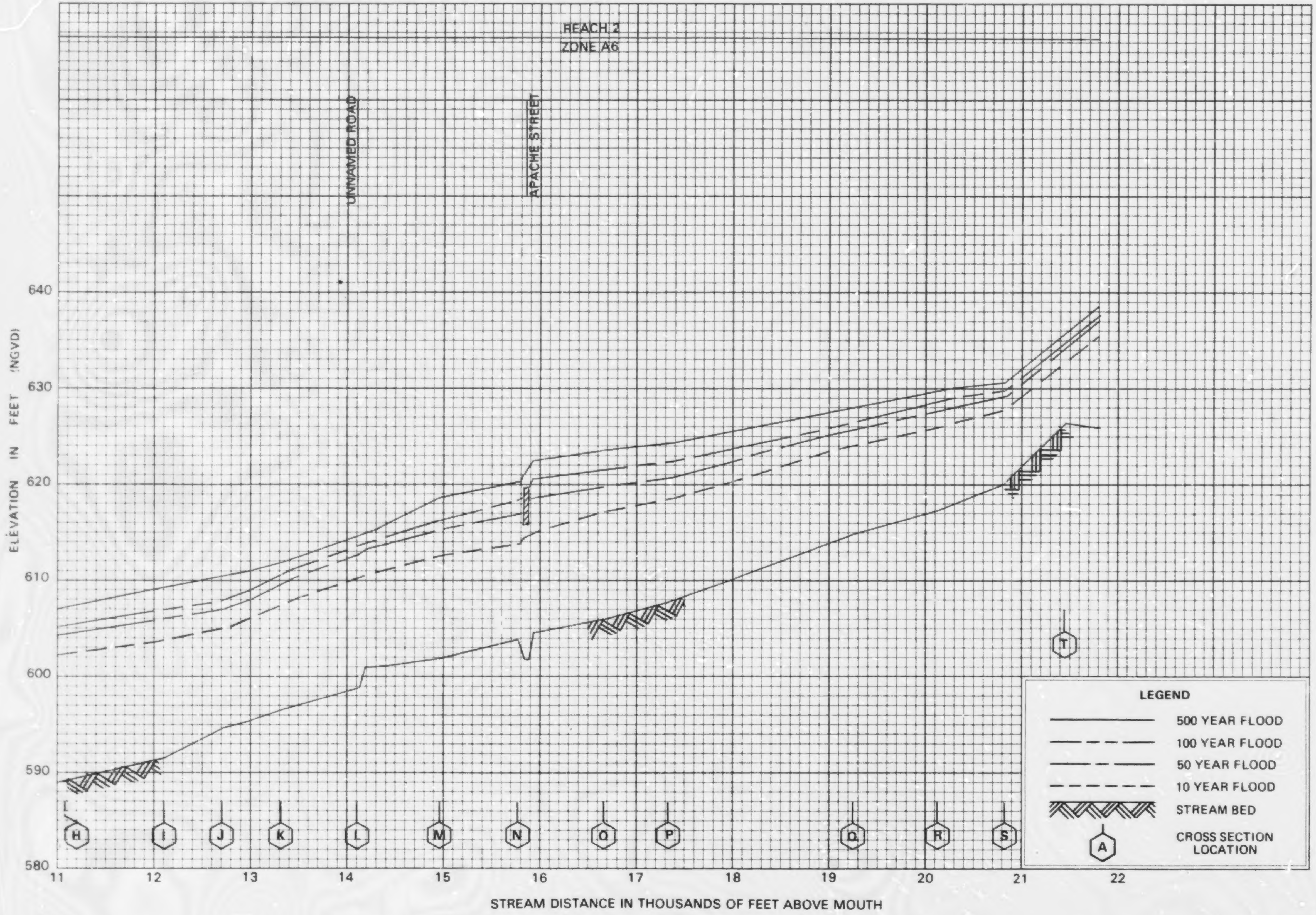


FLOOD PROFILES

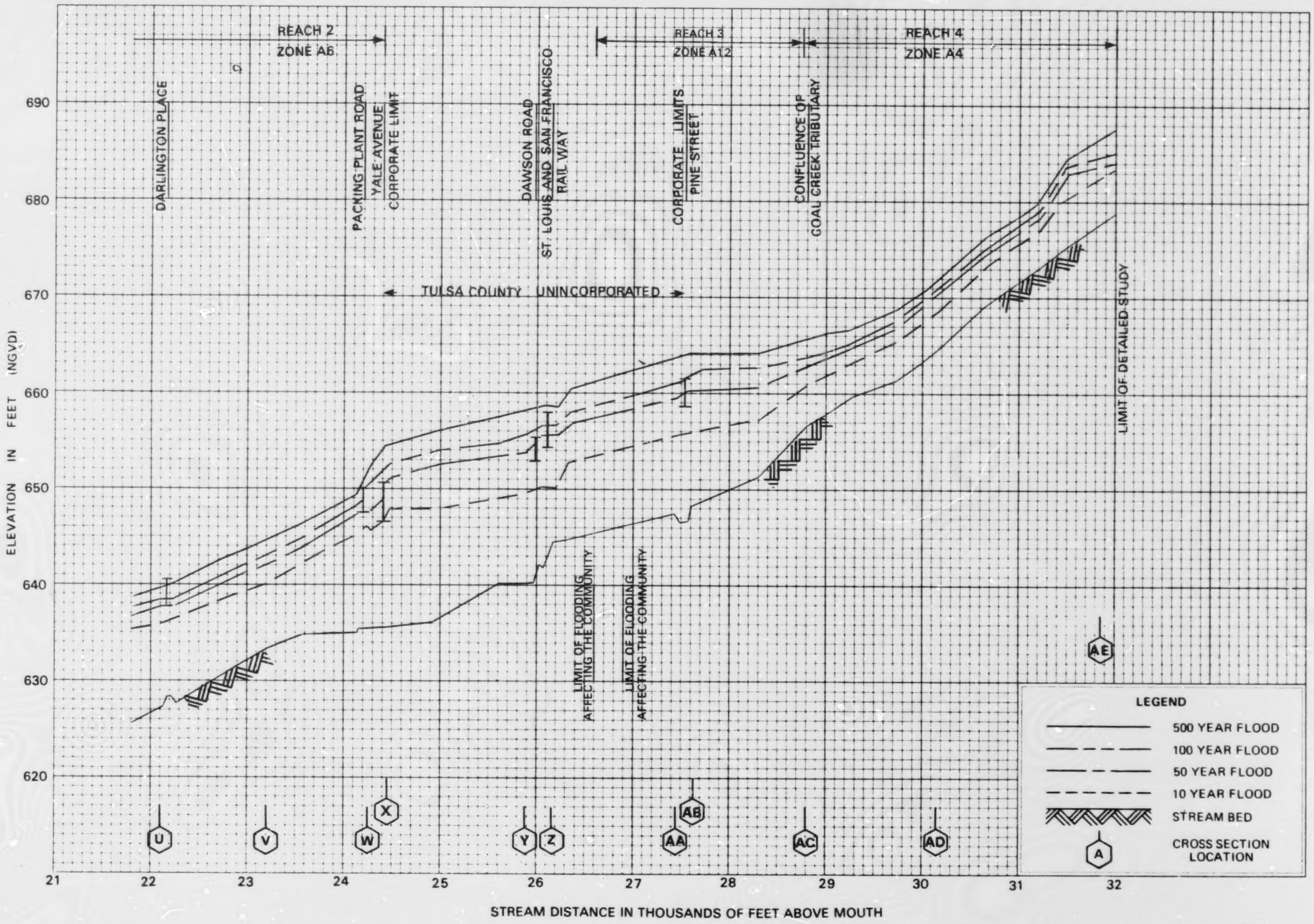
COAL CREEK (NORTH TULSA)

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

12P



FLOOD PROFILES

COAL CREEK (NORTH TULSA)

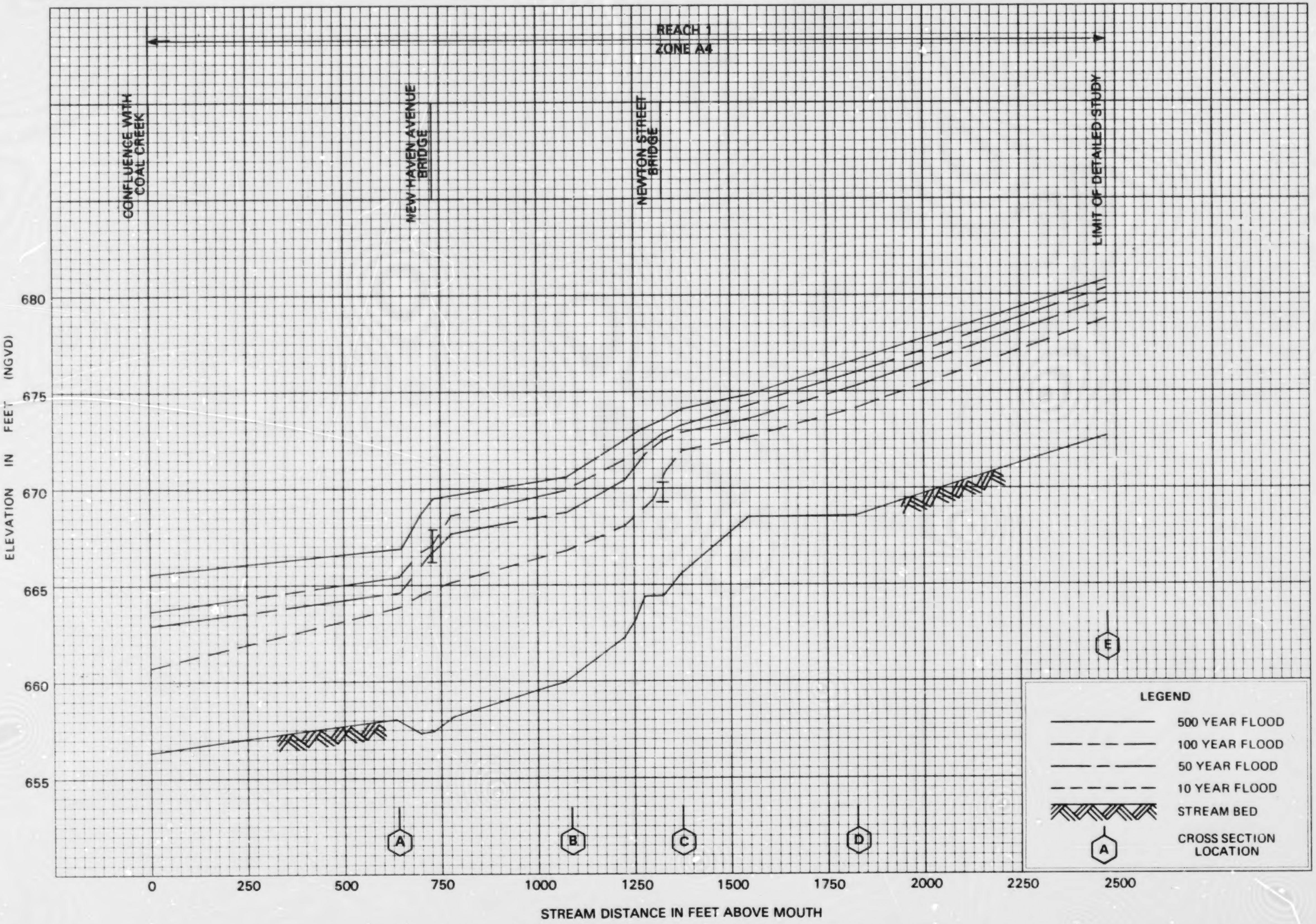
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

13P

108



FLOOD PROFILES

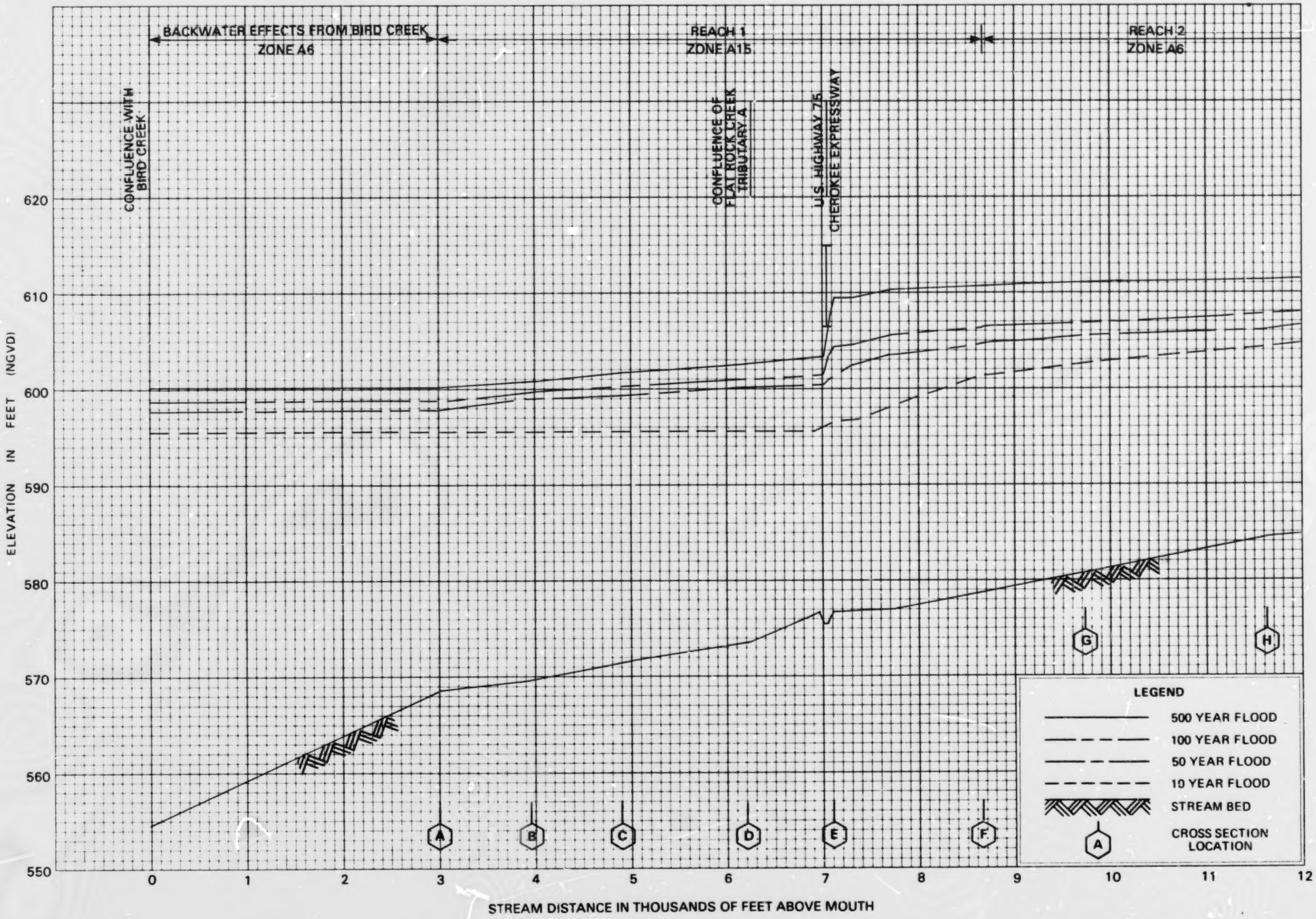
COAL CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

14P



FLOOD PROFILES

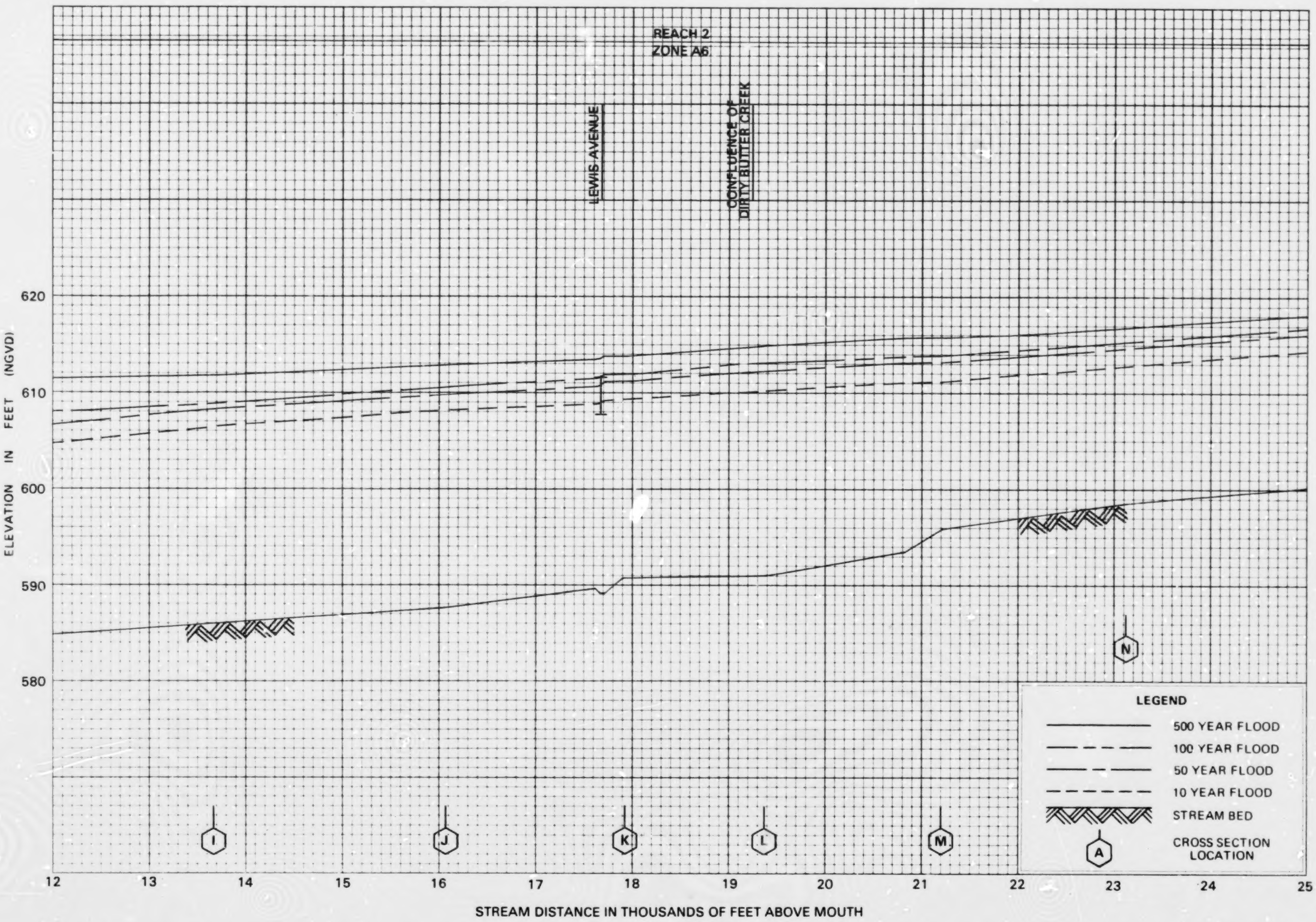
FLAT ROCK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

15P



FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

FLOOD PROFILES

FLAT ROCK CREEK

16P

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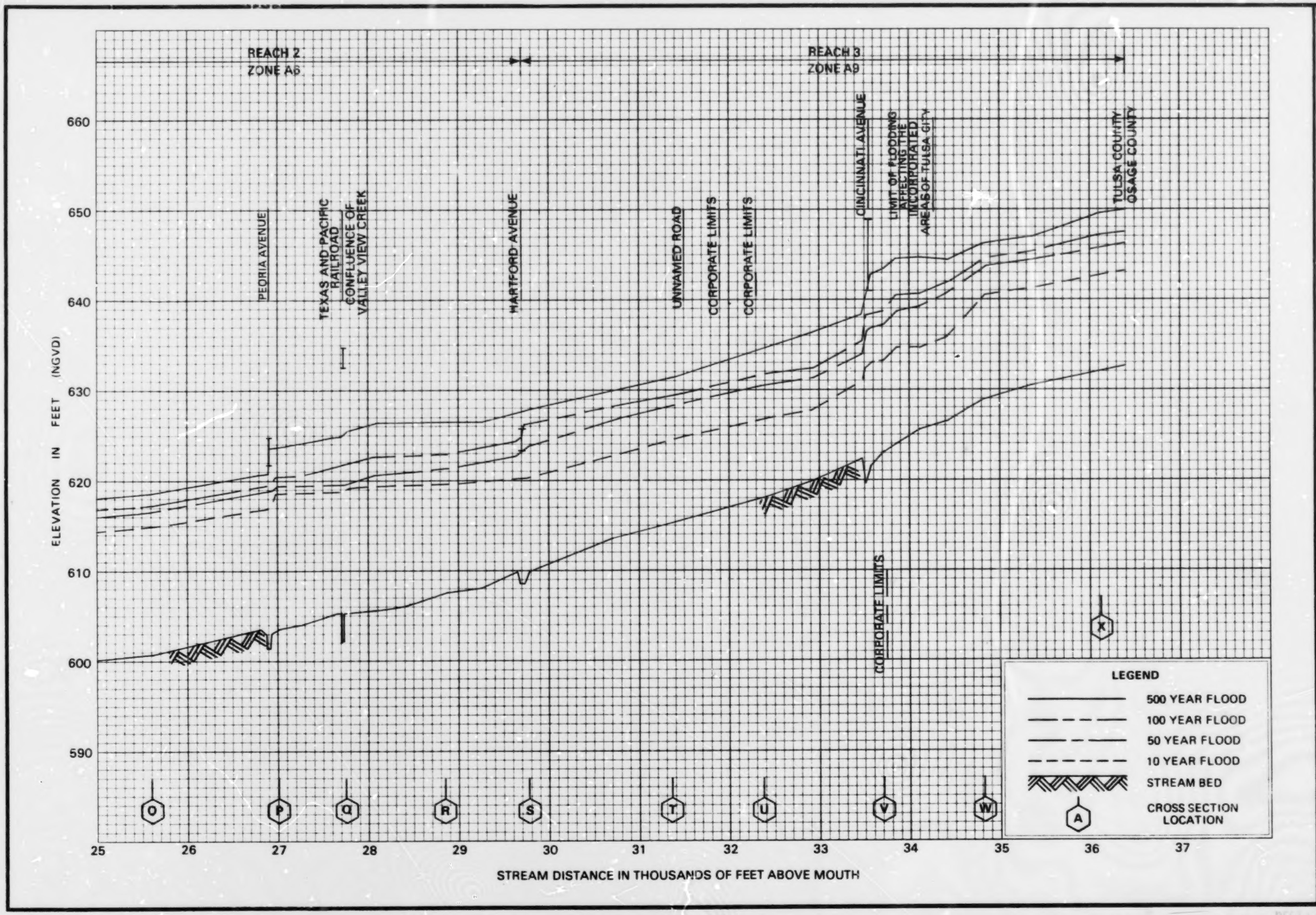


FLOOD PROFILES

FLAT ROCK CREEK

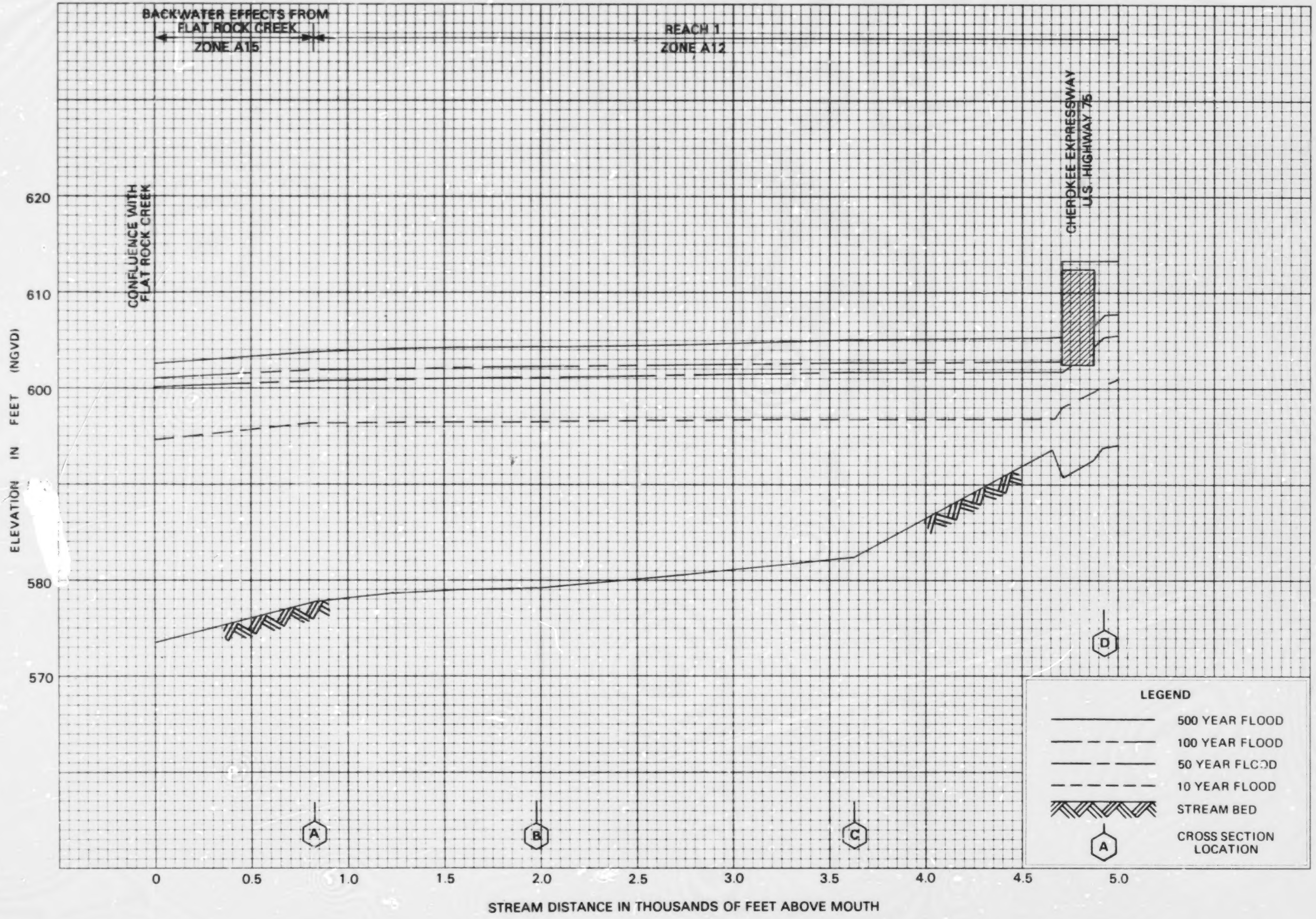
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

17P

112



FLOOD PROFILES

FLAT ROCK CREEK TRIBUTARY A

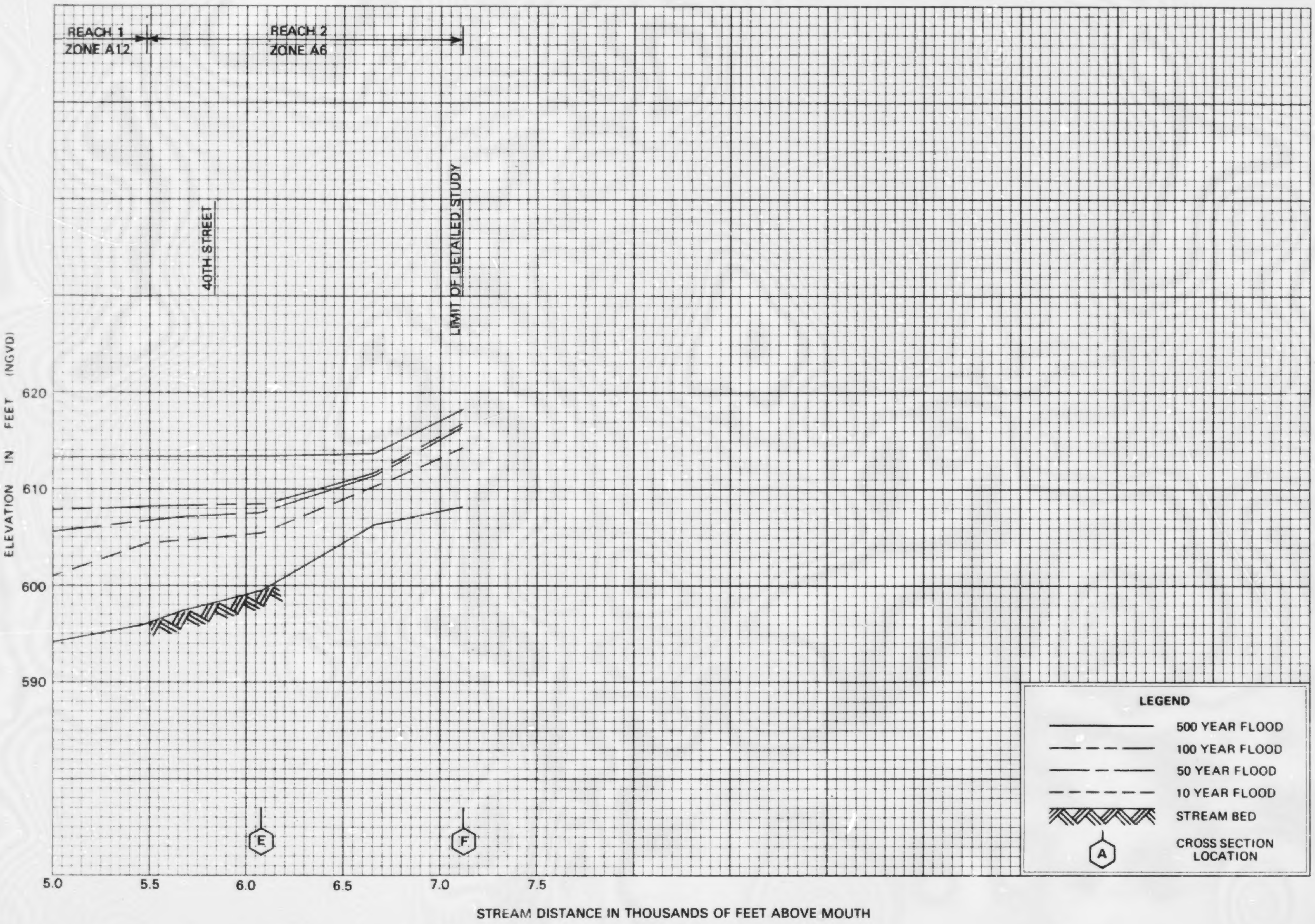
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

18P

113



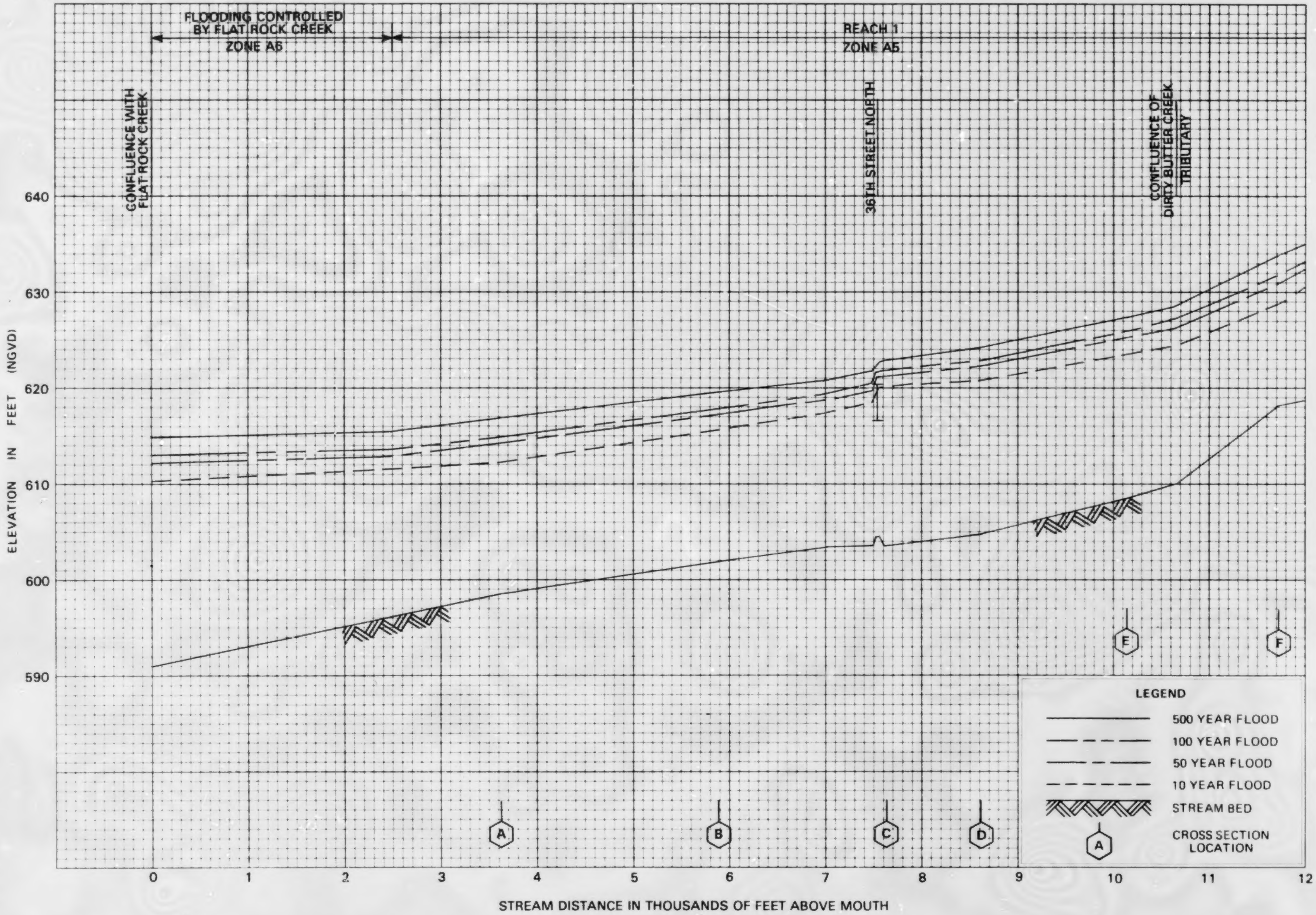
FLOOD PROFILES

FLAT ROCK CREEK TRIBUTARY A

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)



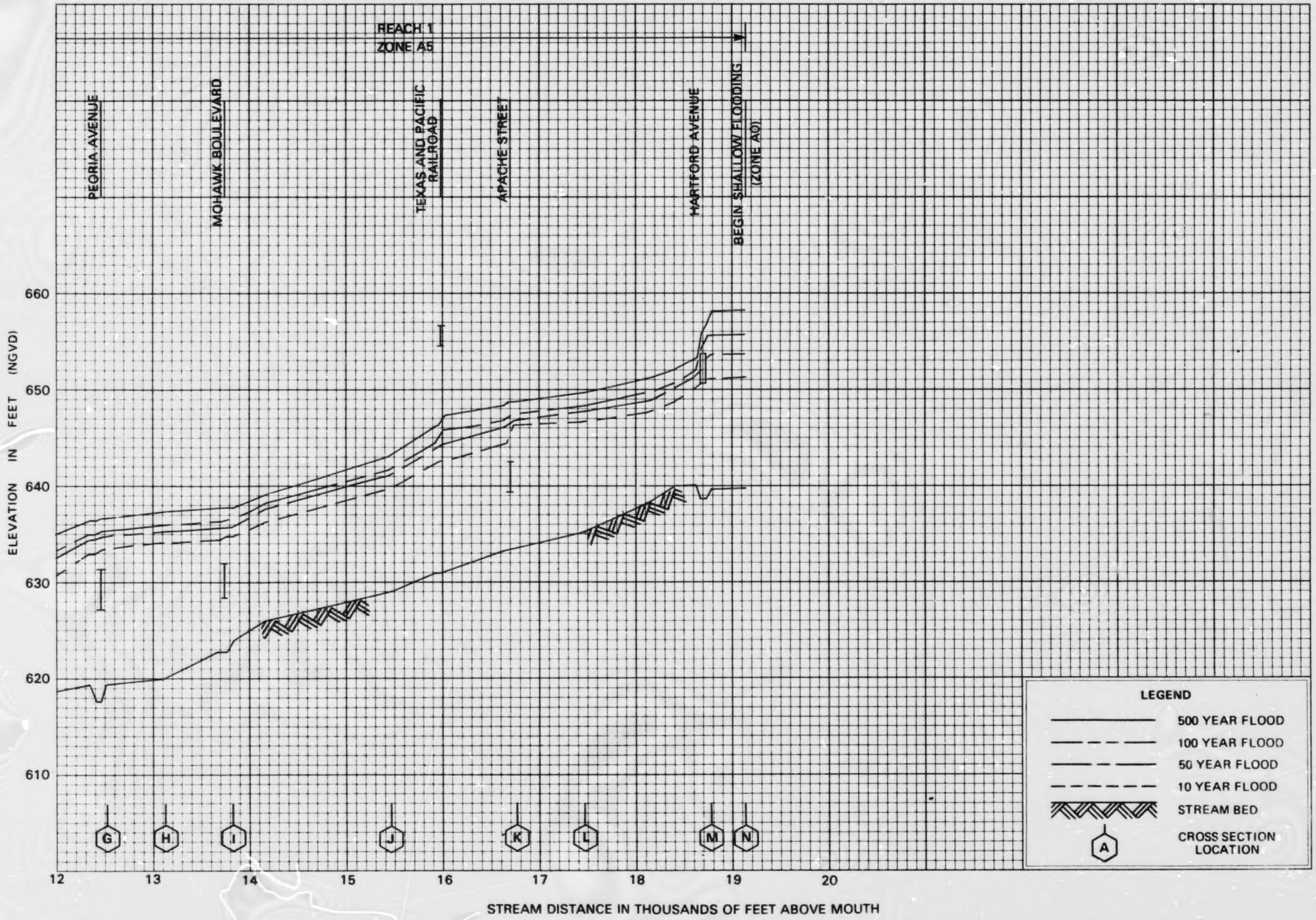
FLOOD PROFILES

DIRTY BUTTER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)



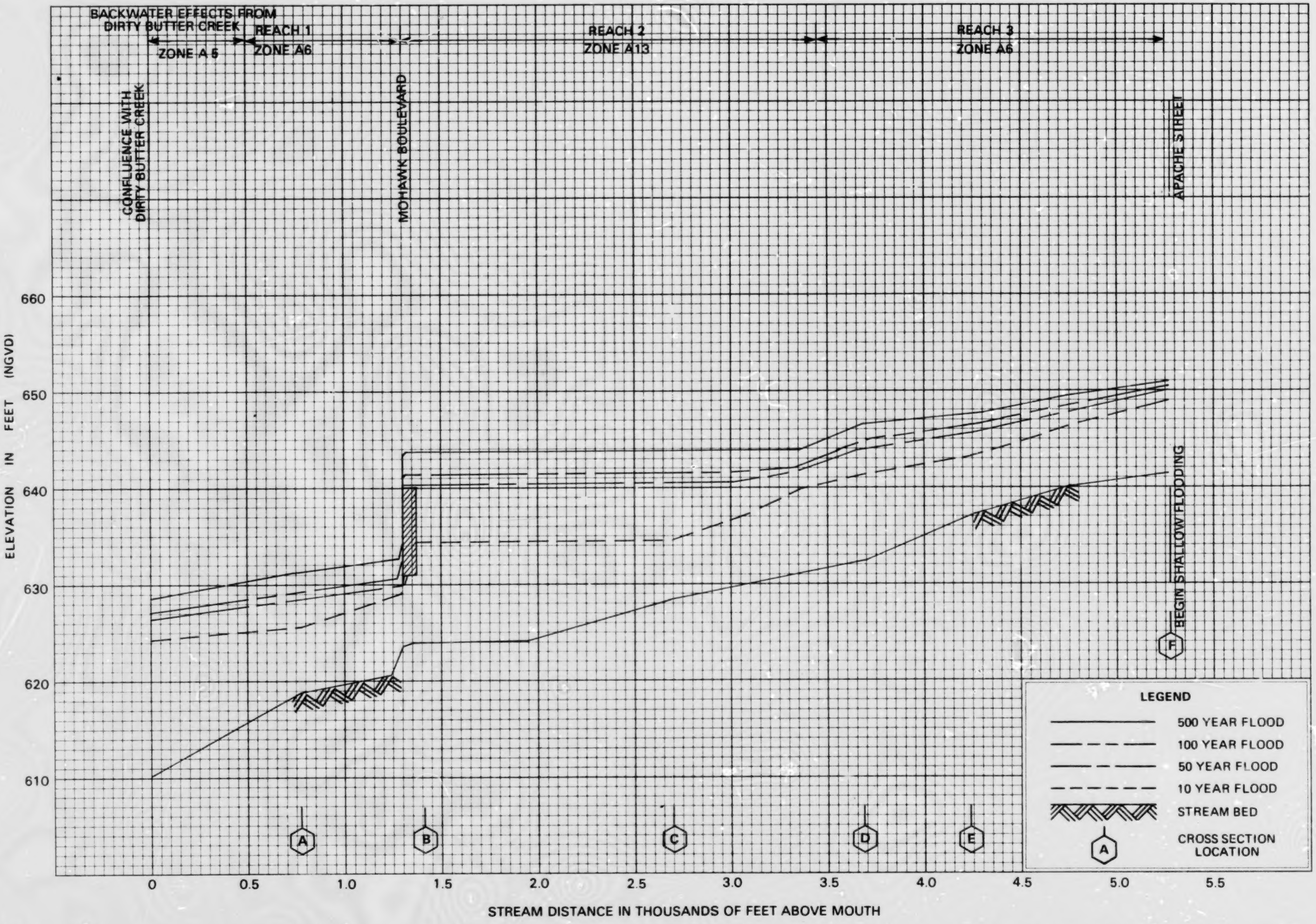
FLOOD PROFILES

DIRTY BUTTER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)



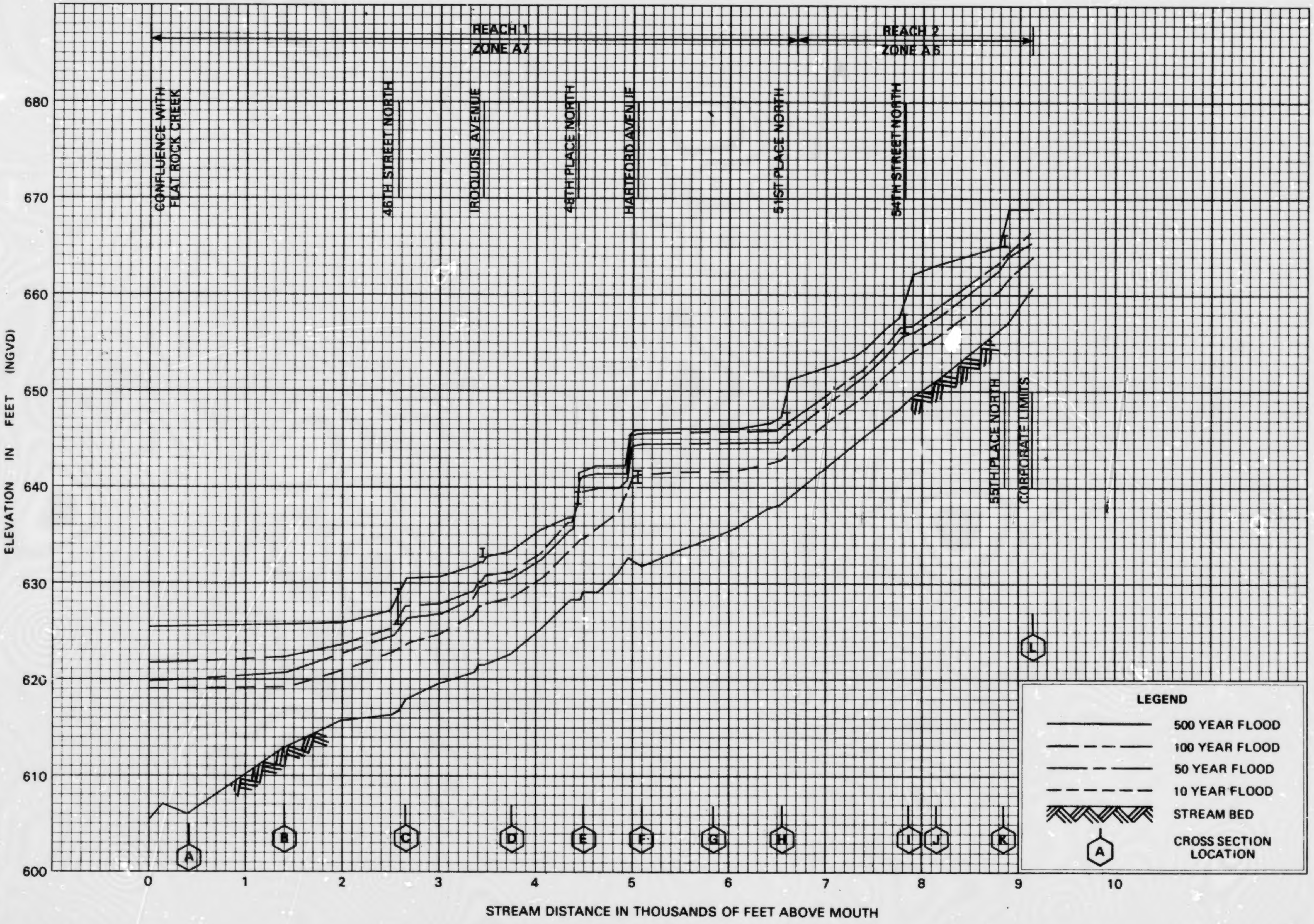
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

FLOOD PROFILES

DIRTY BUTTER CREEK TRIBUARY



FLOOD PROFILES

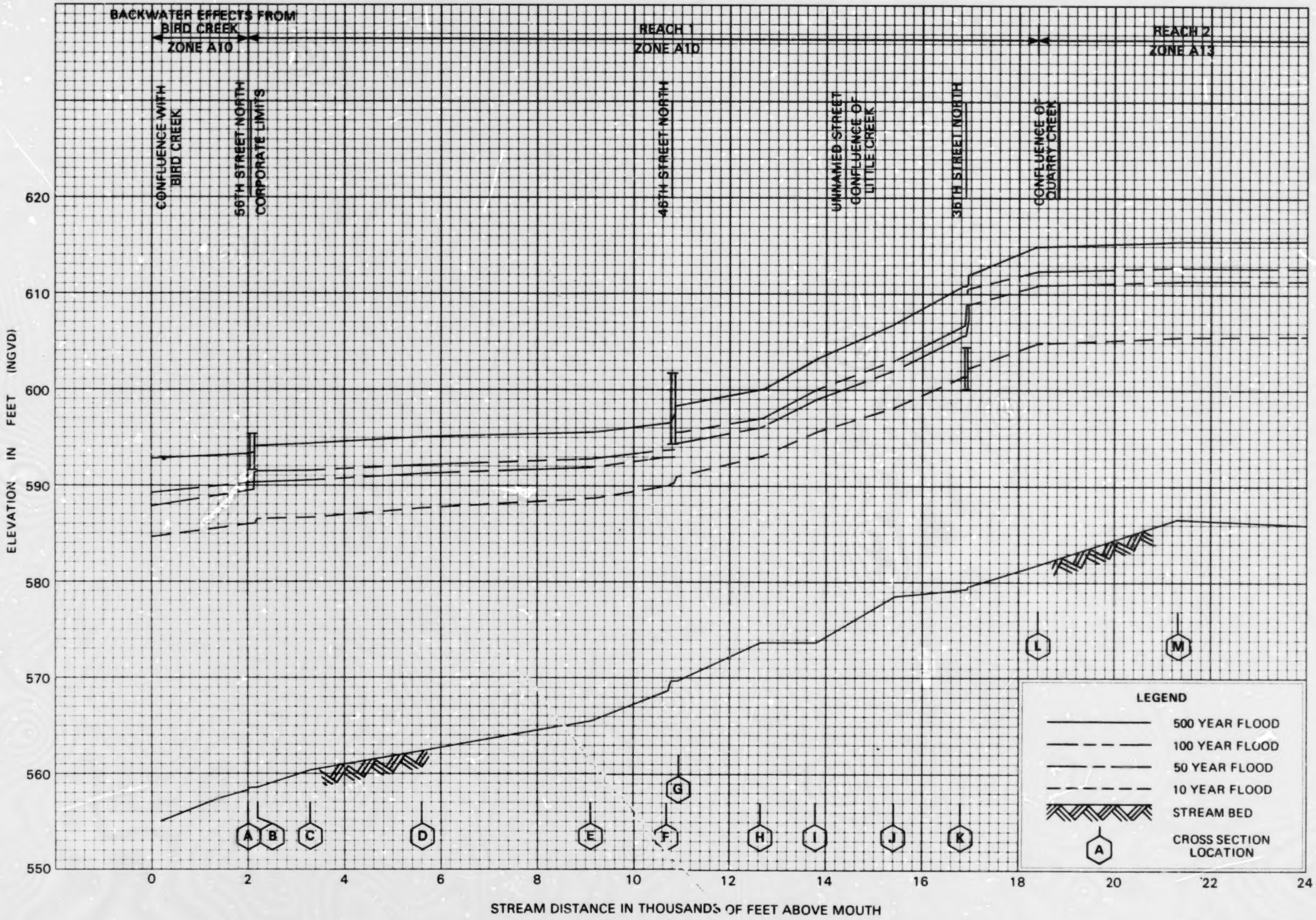
VALLEY VIEW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

23P

118



FLOOD PROFILES

MINGO CREEK

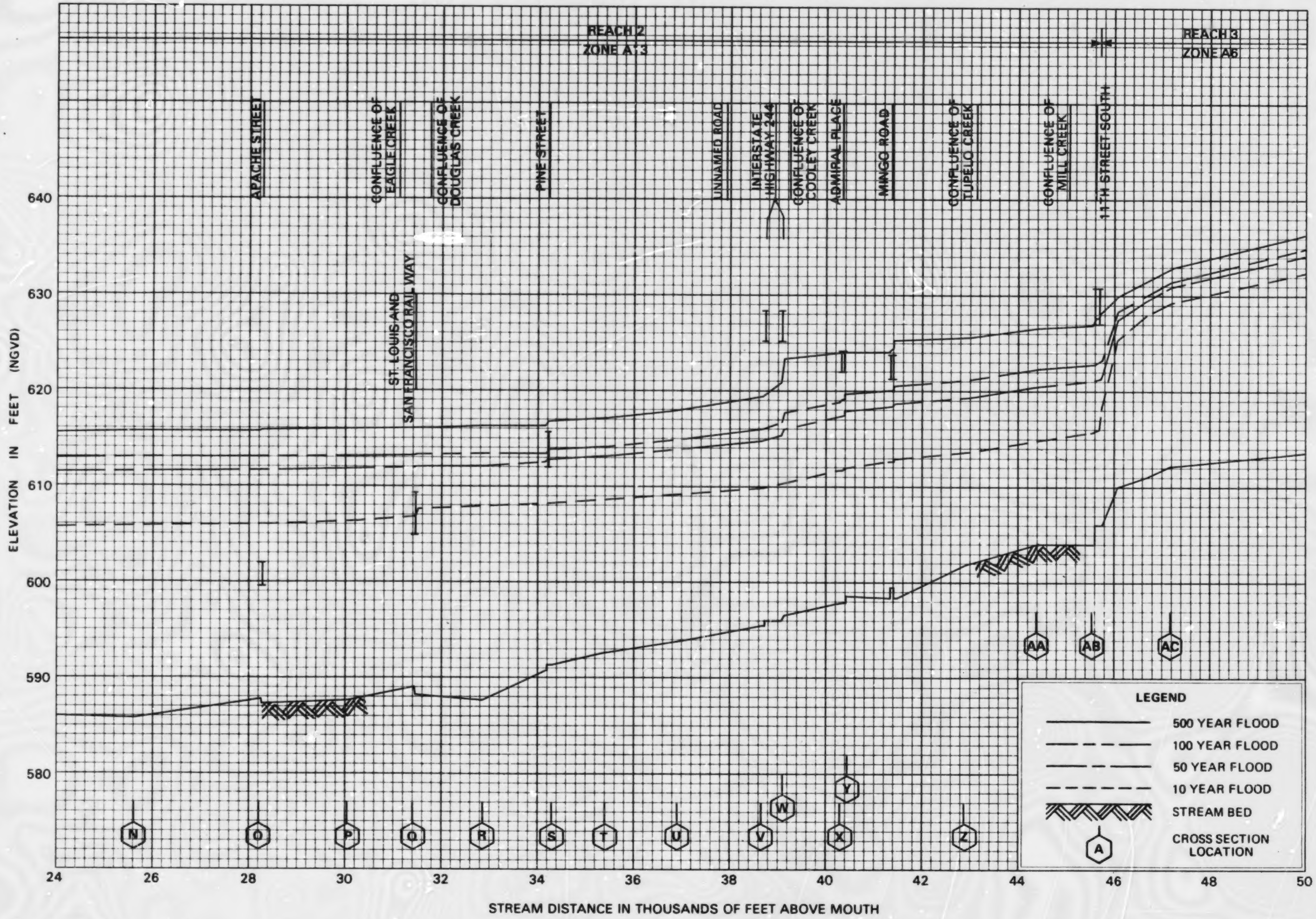
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

24P

119



FLOOD PROFILES

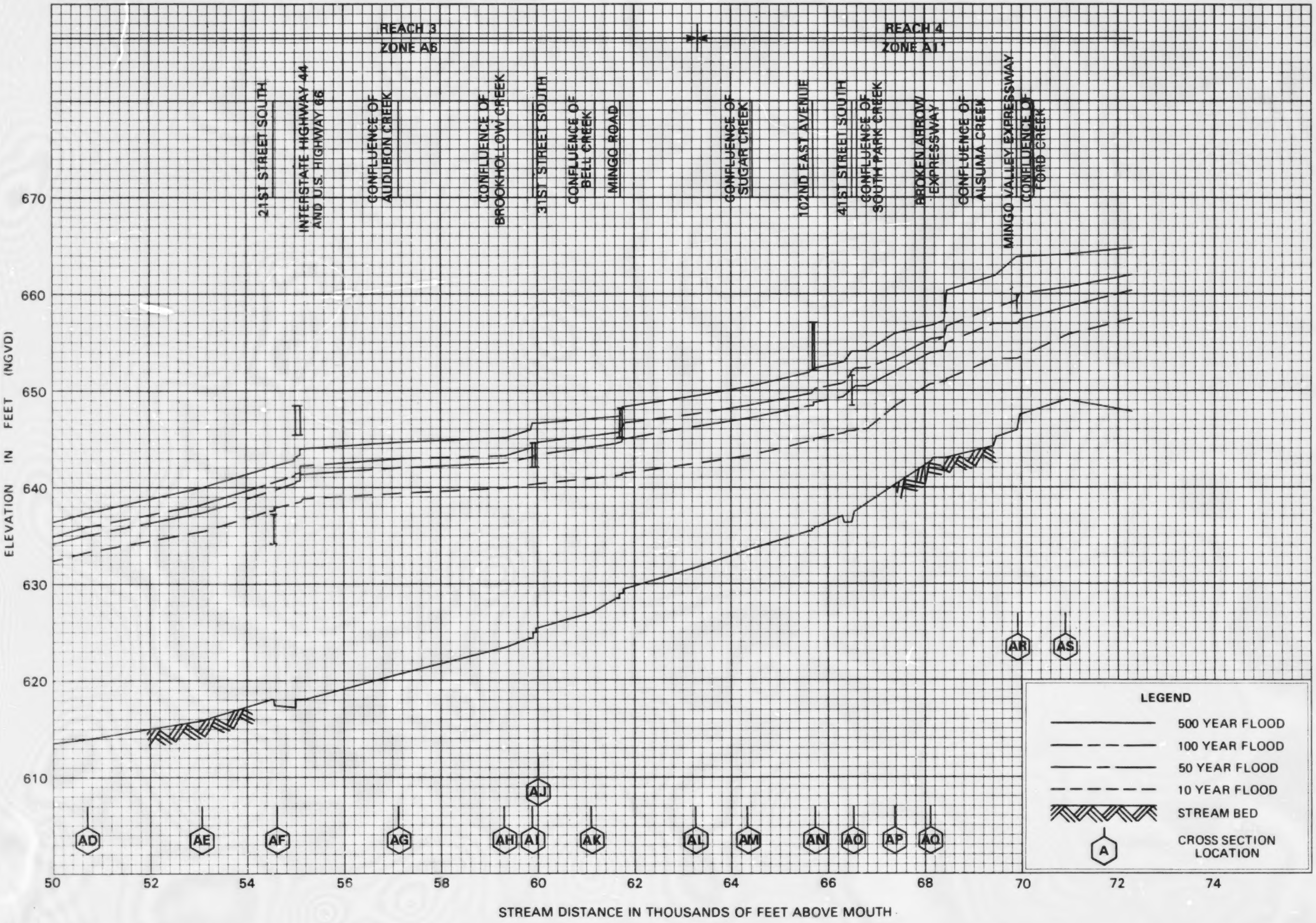
MINGO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

25P



FEDERAL EMERGENCY MANAGEMENT AGENCY

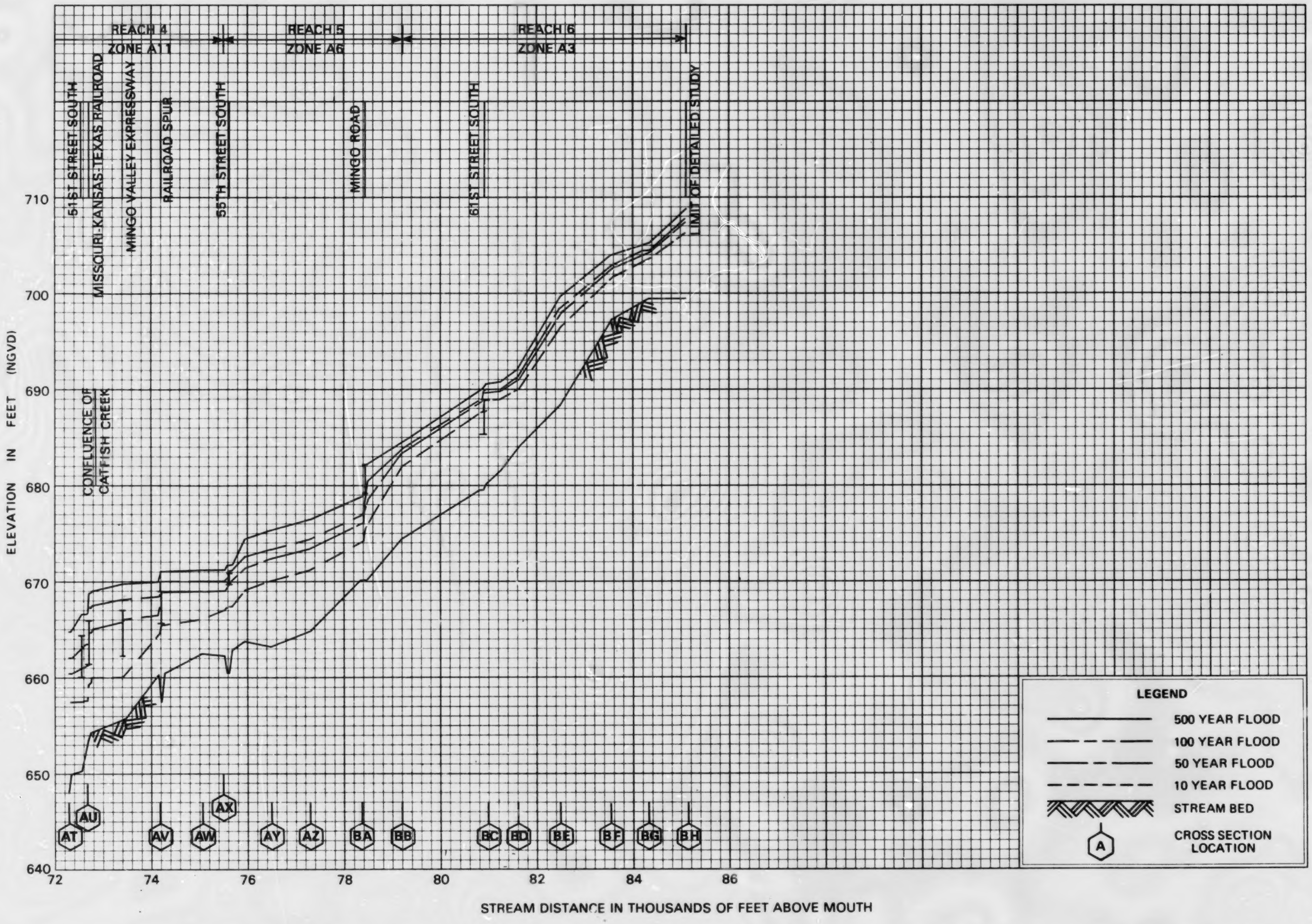
CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

FLOOD PROFILES

MINGO CREEK

26P



FLOOD PROFILES

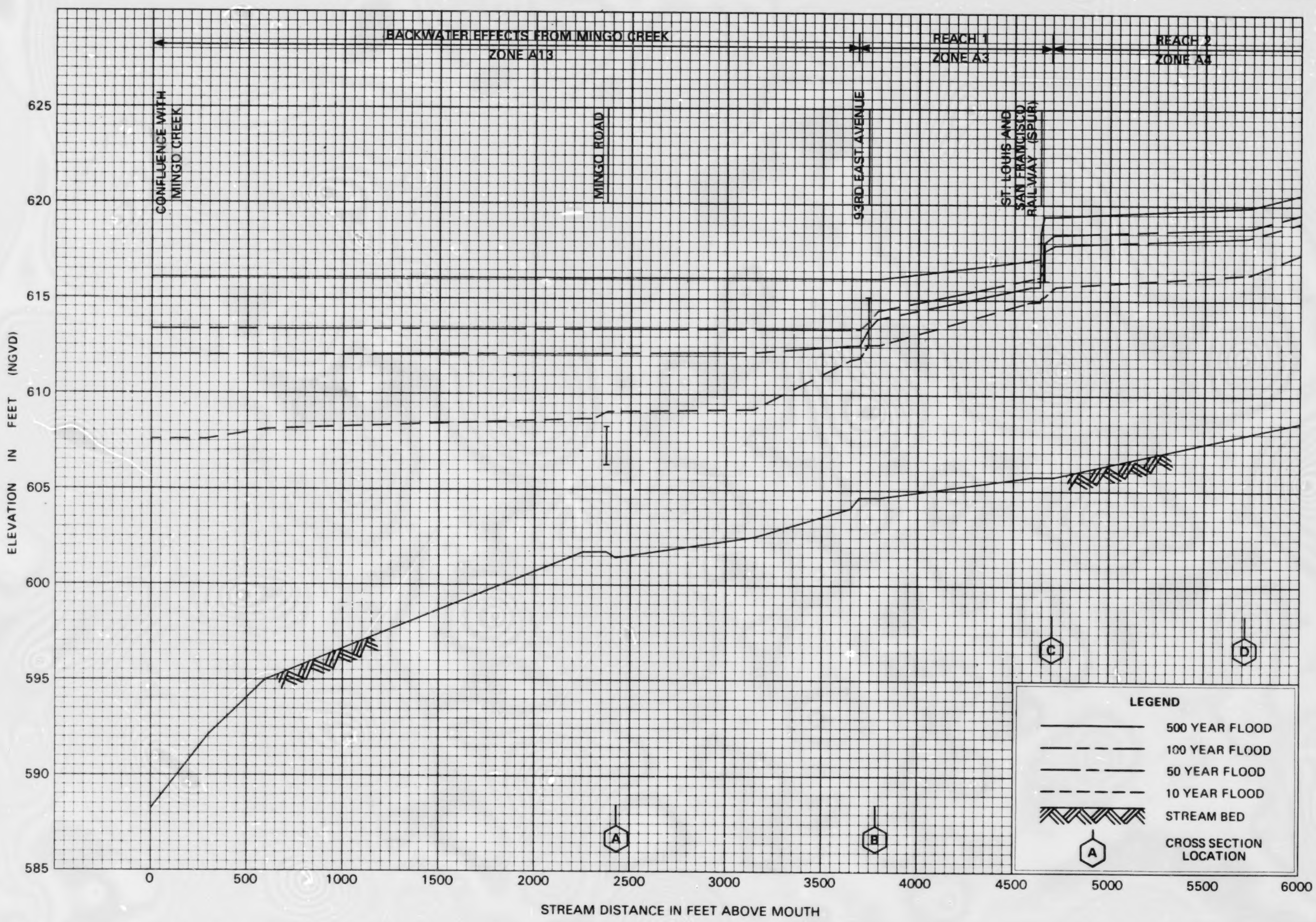
MINGO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

27P



FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

FLOOD PROFILES

DOUGLAS CREEK

28P

123

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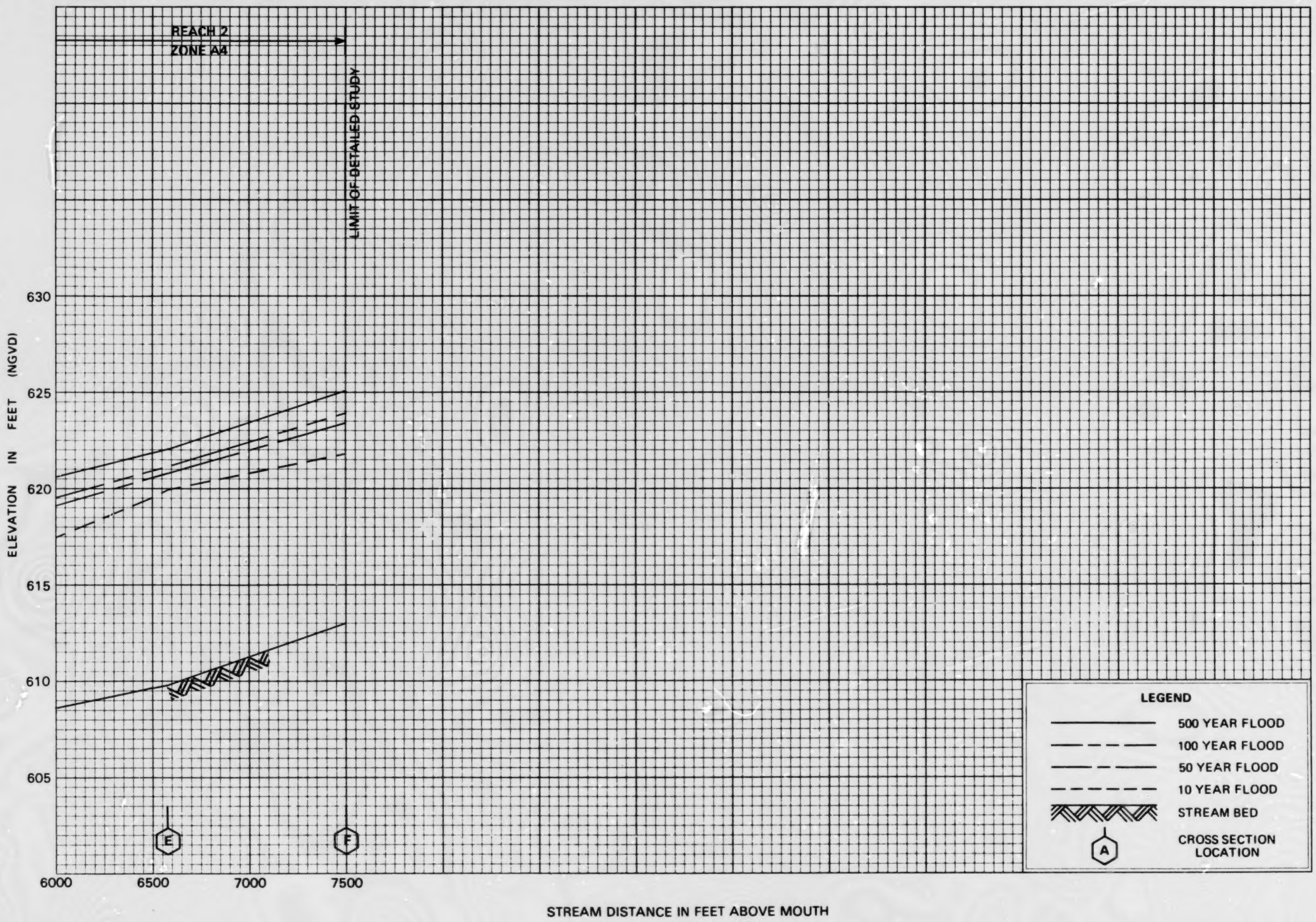


FLOOD PROFILES

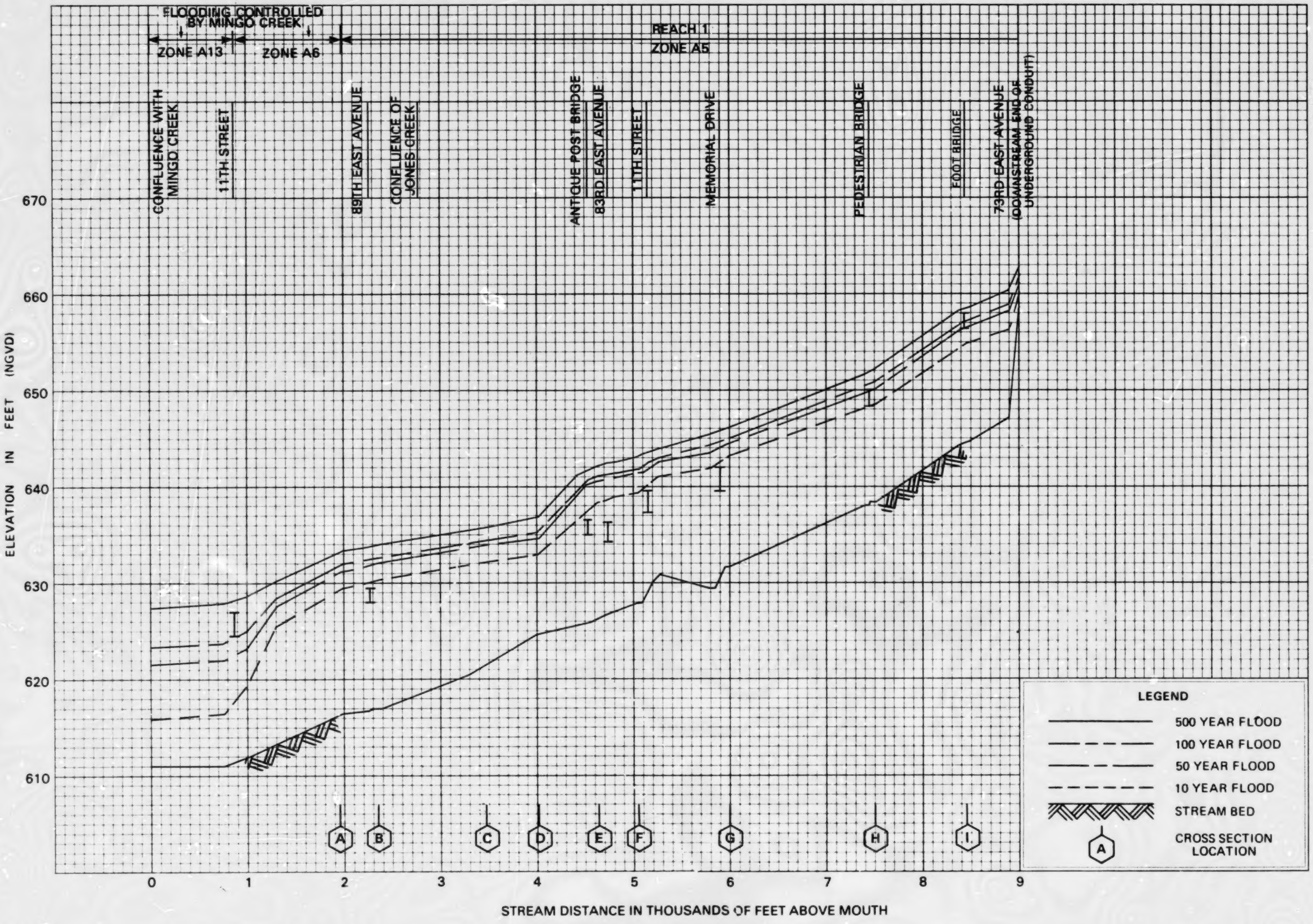
DOUGLAS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

29P



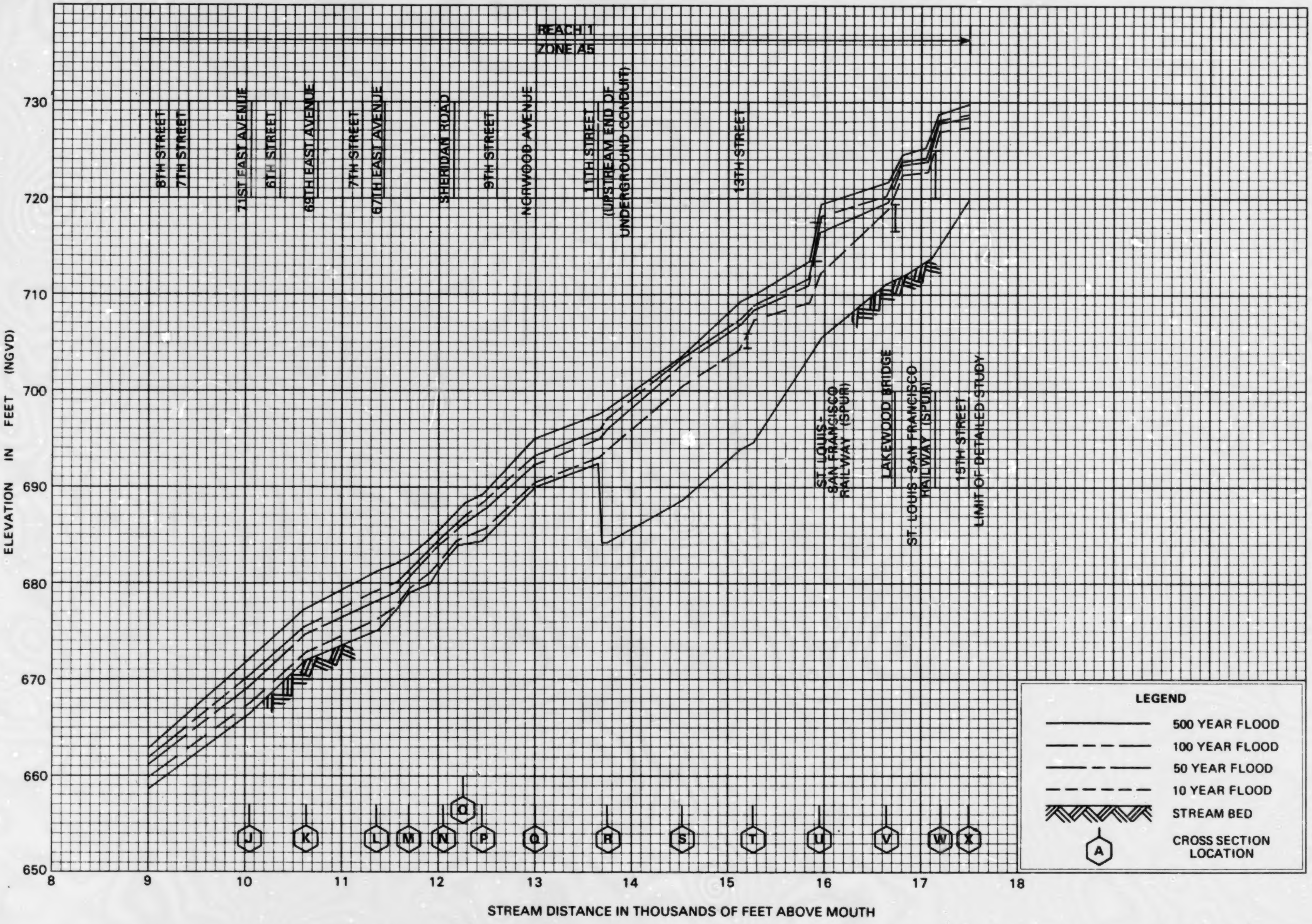
FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)



FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

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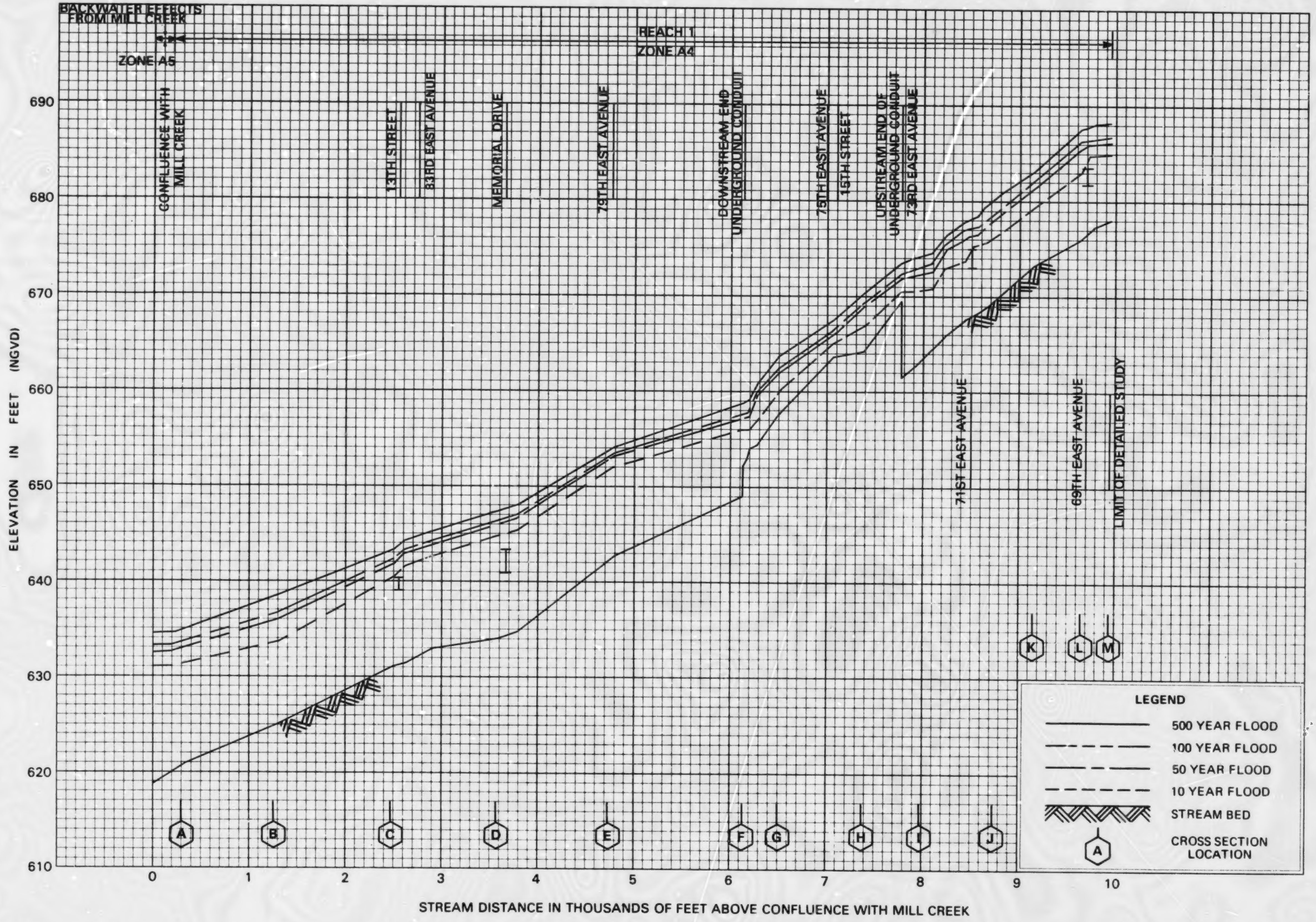
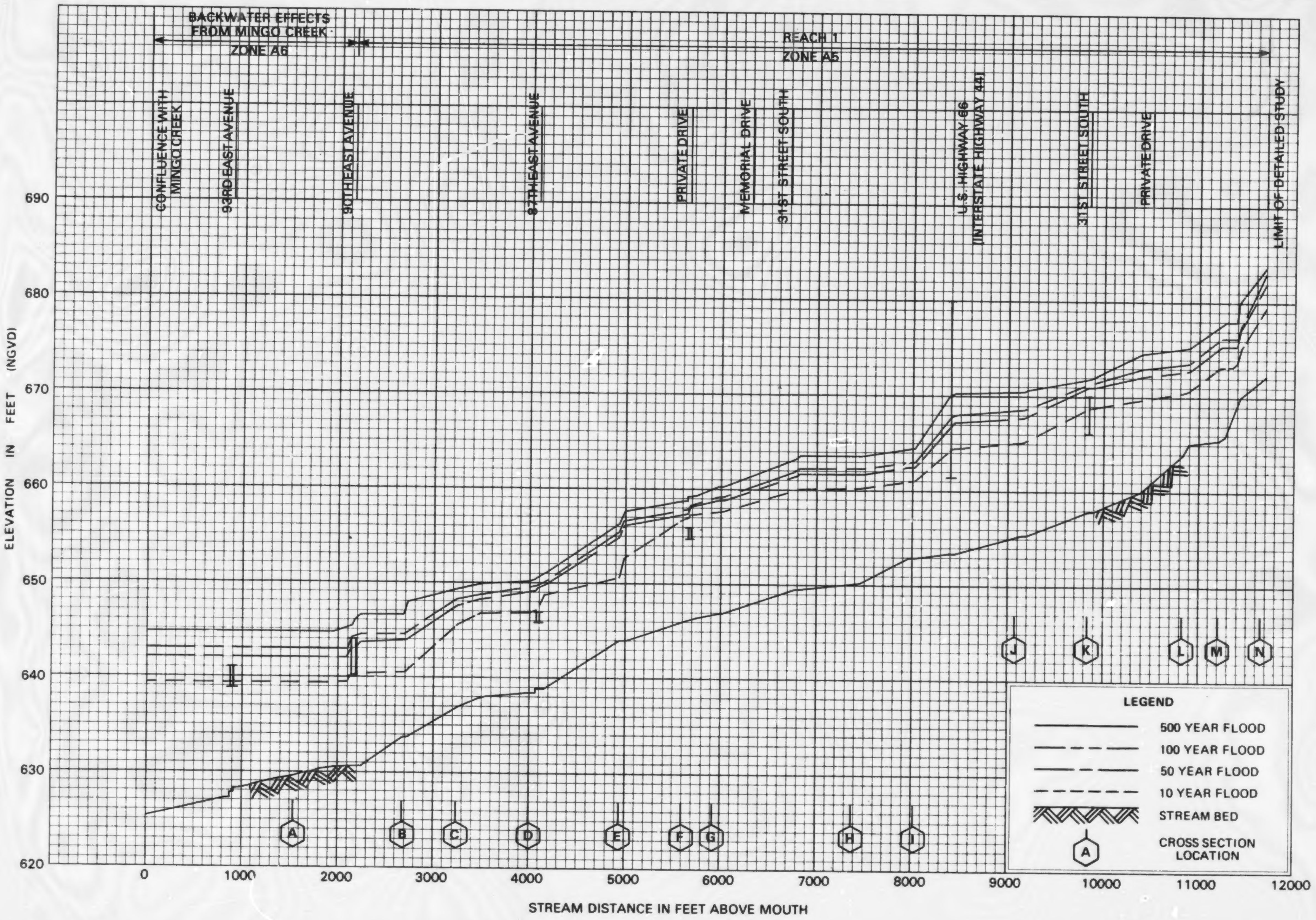


FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

FLOOD PROFILES

JONES CREEK



FLOOD PROFILES

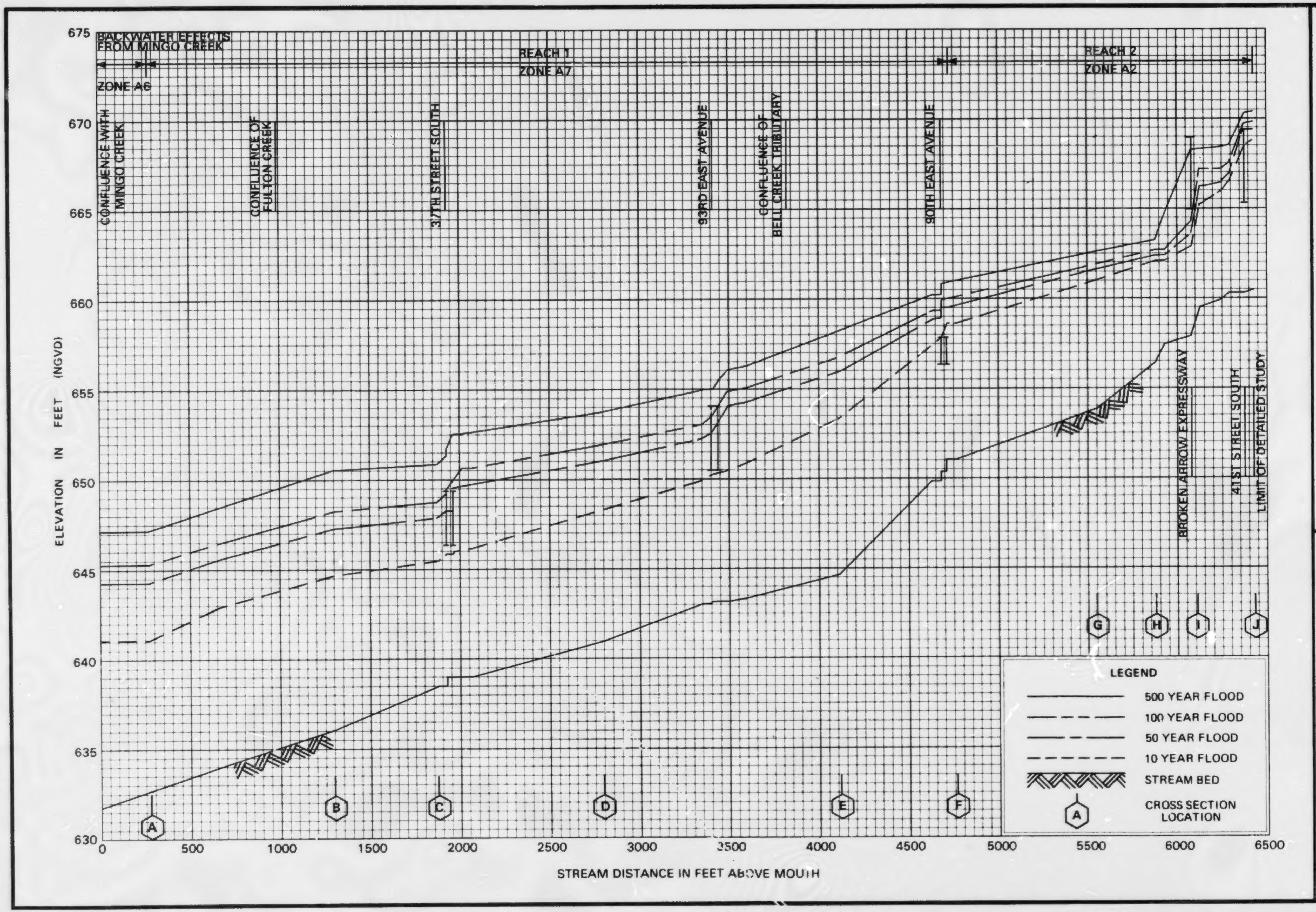
AUDUBON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

33P

128



FEDERAL EMERGENCY MANAGEMENT AGENCY

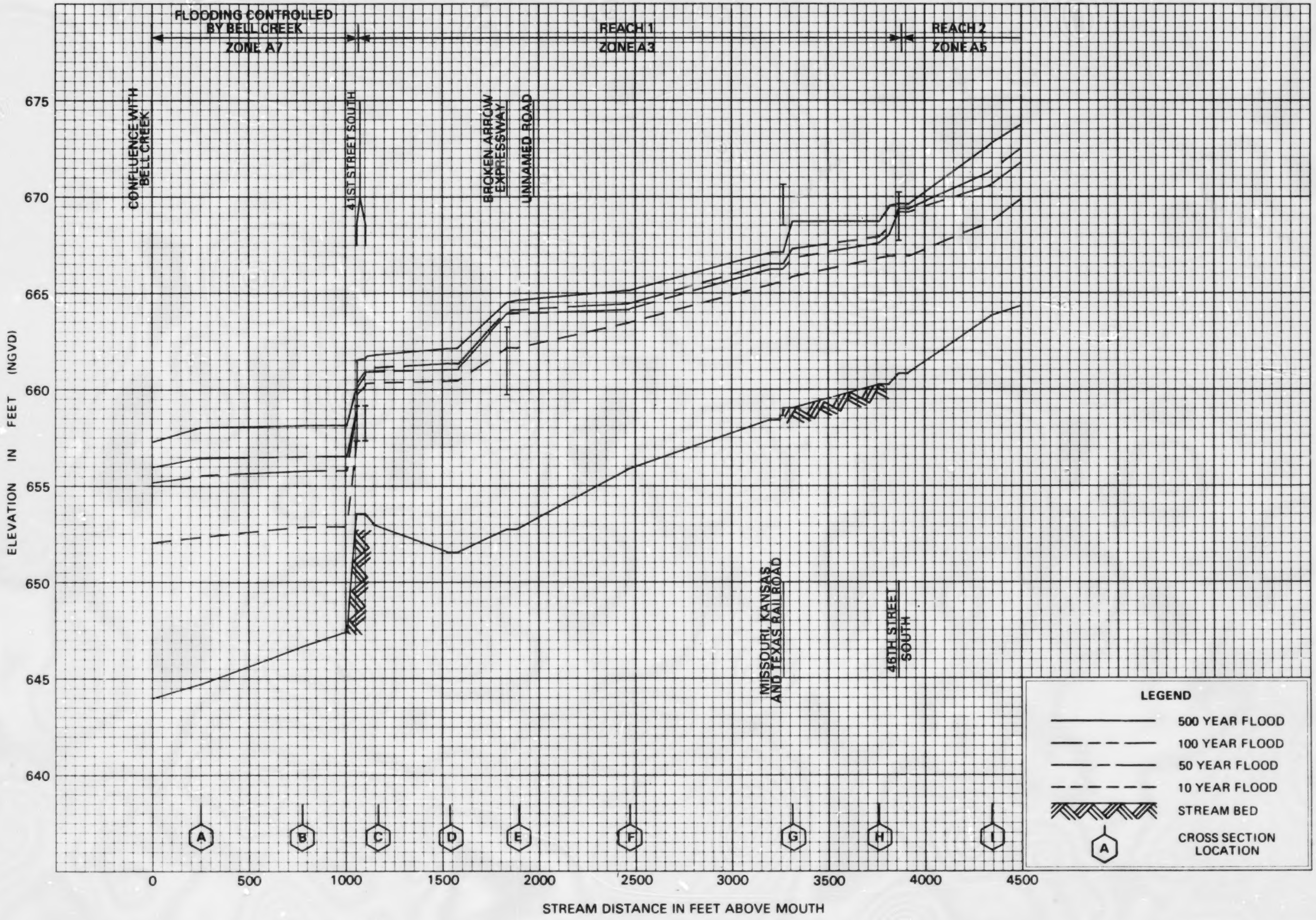
FLOOD PROFILES

BELL CREEK

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

34P



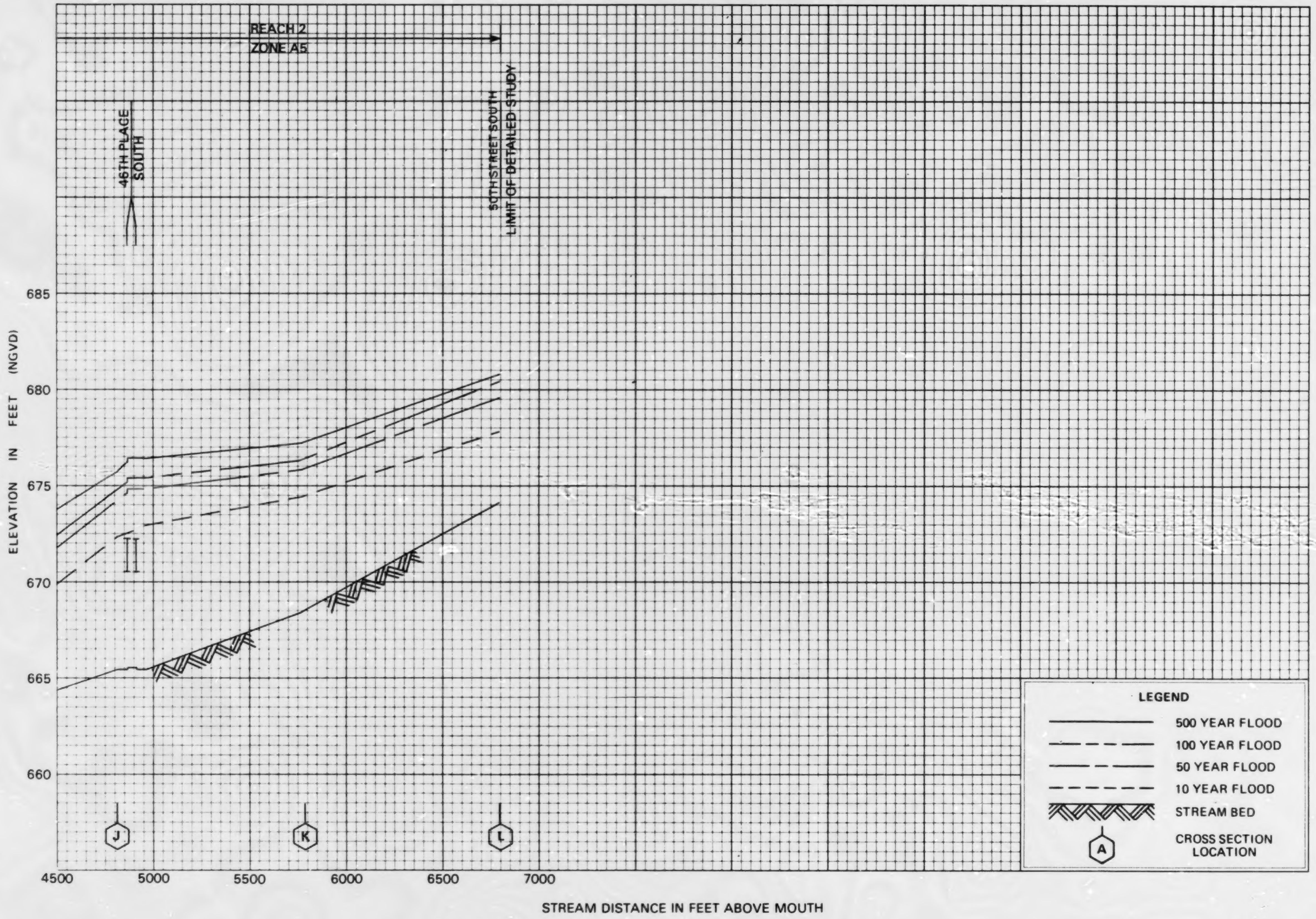
FLOOD PROFILES

BELL CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)



FLOOD PROFILES

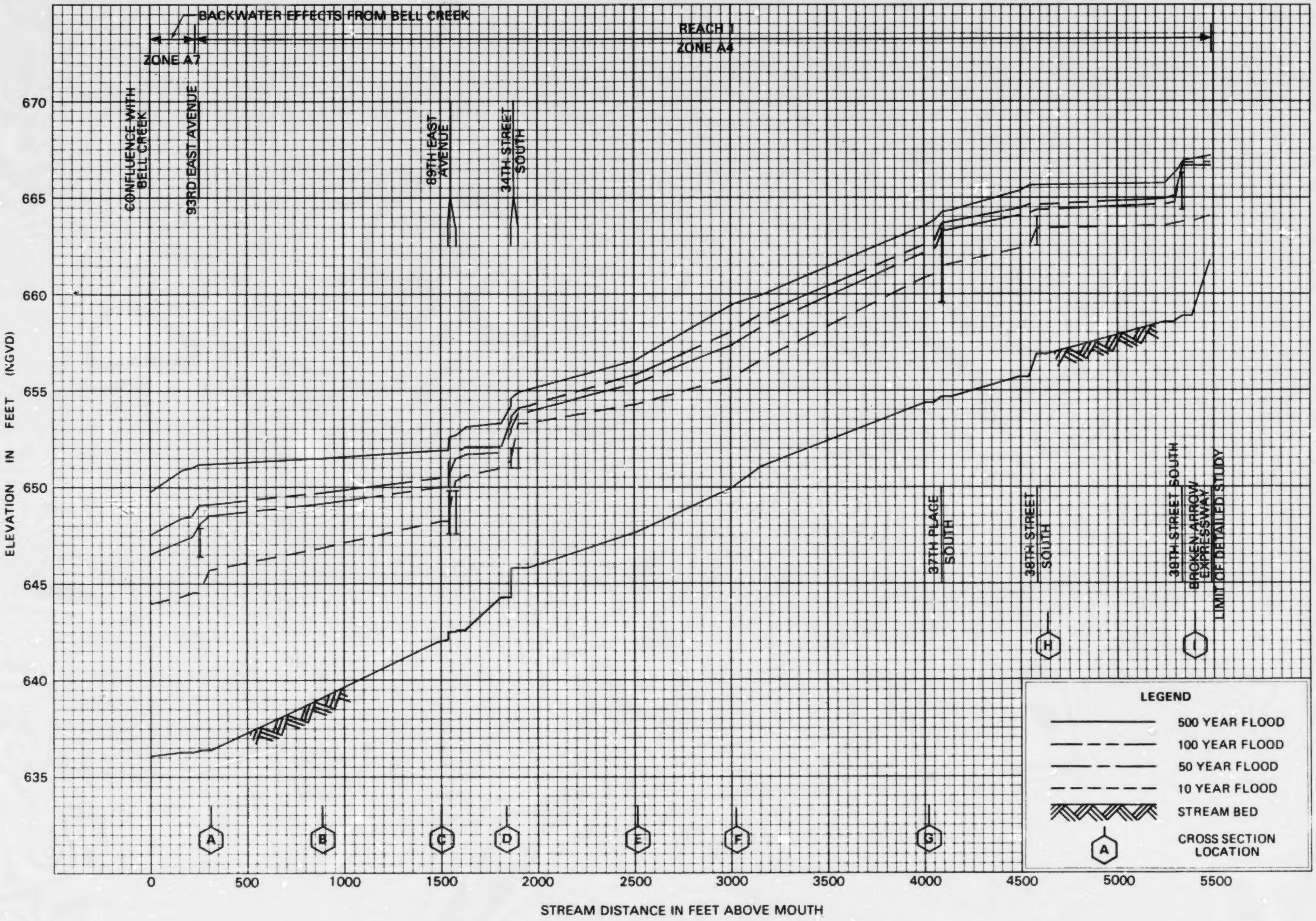
BELL CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

36P



FLOOD PROFILES

FULTON CREEK

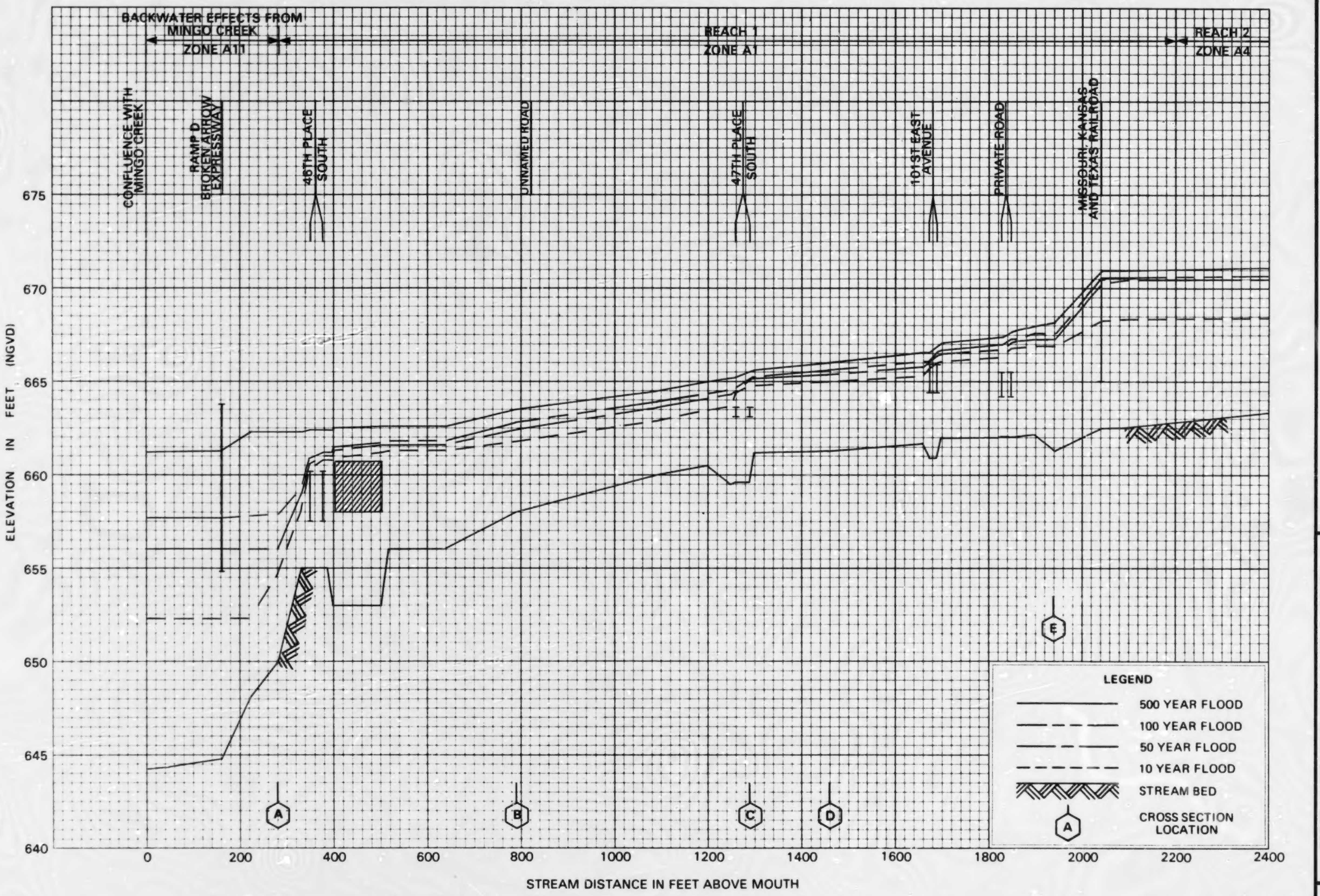
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

37P

132



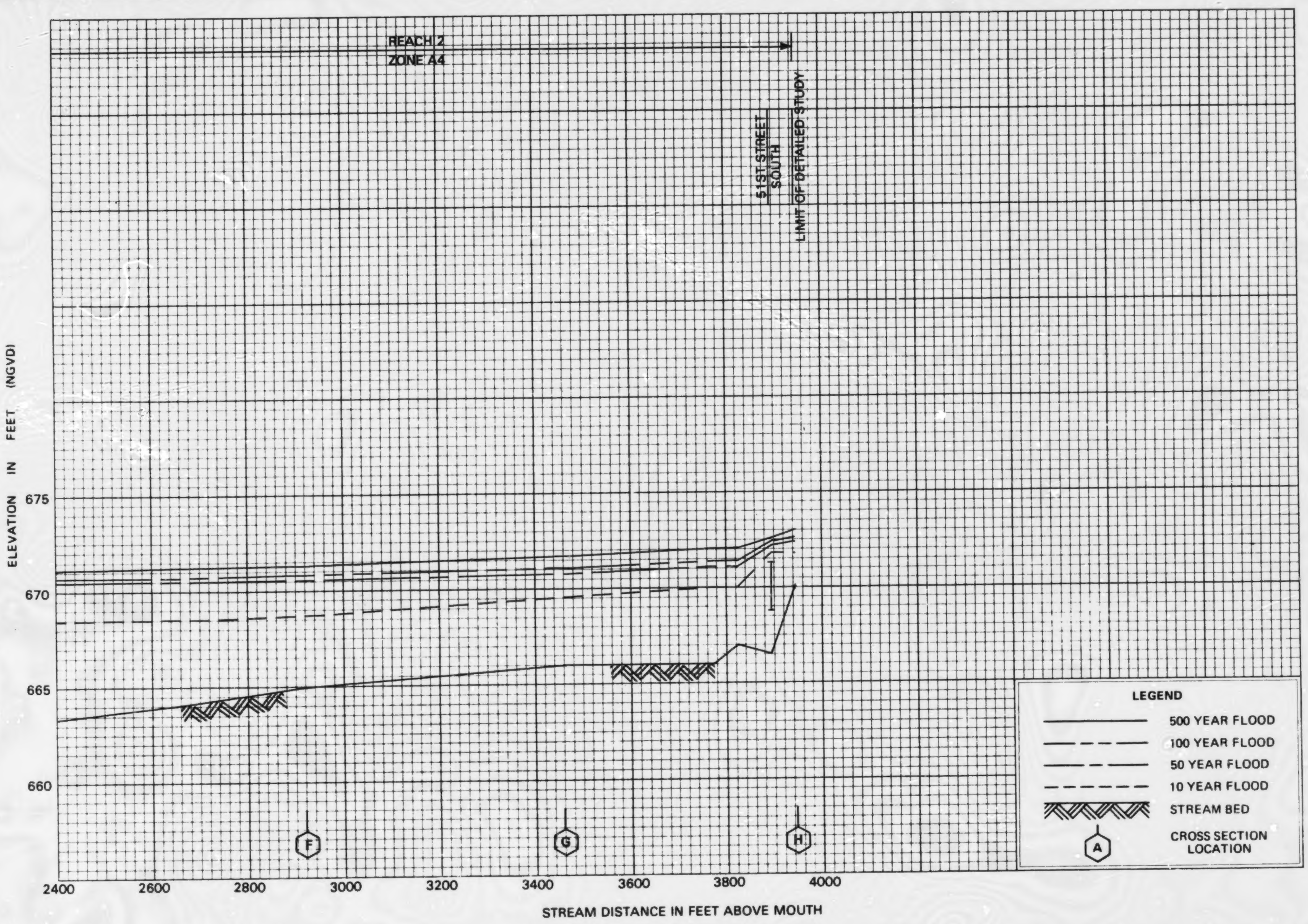
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

FLOOD PROFILES

ALSUMA CREEK



FEDERAL EMERGENCY MANAGEMENT AGENCY

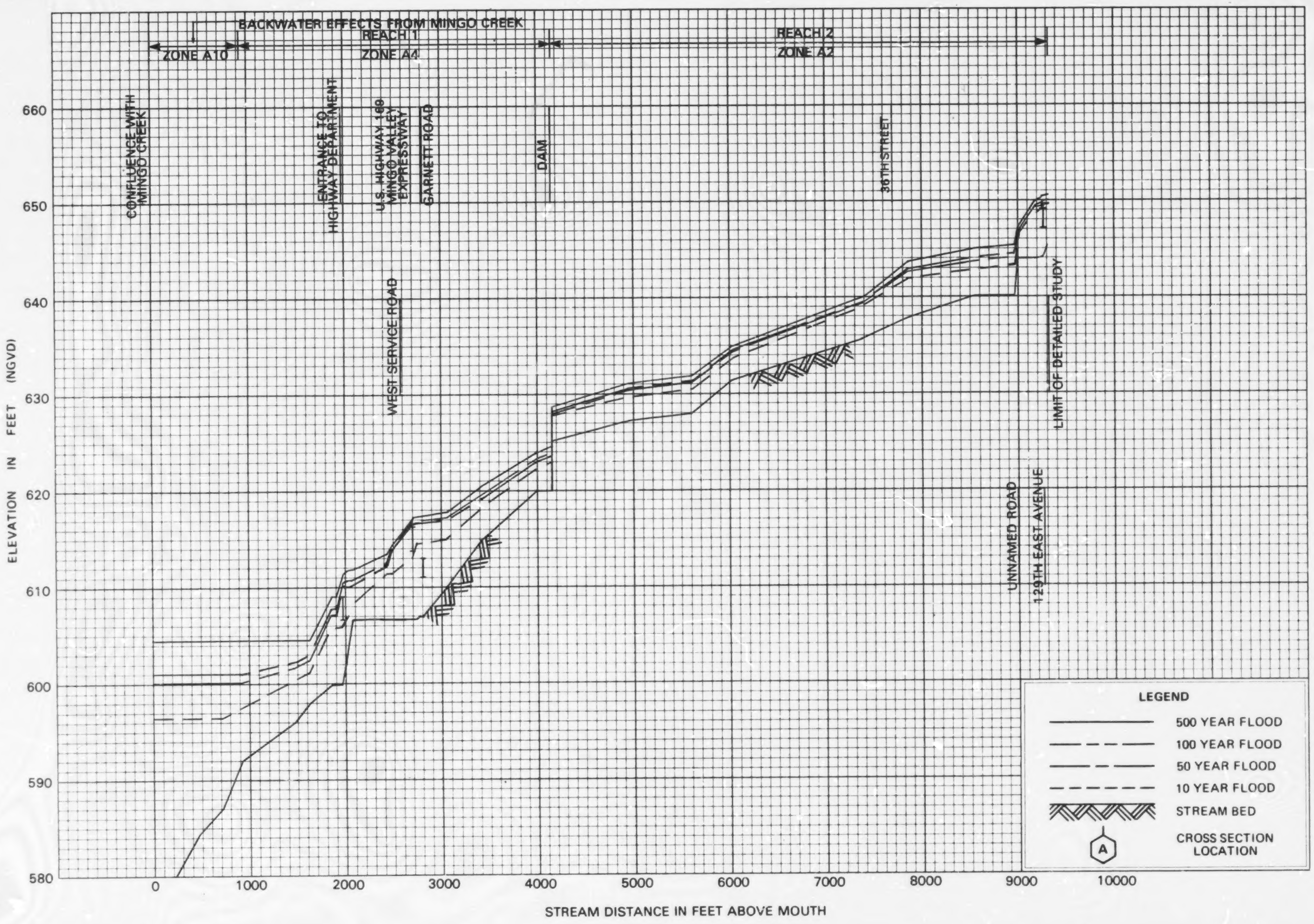
FLOOD PROFILES

ALSUMA CREEK

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

39P

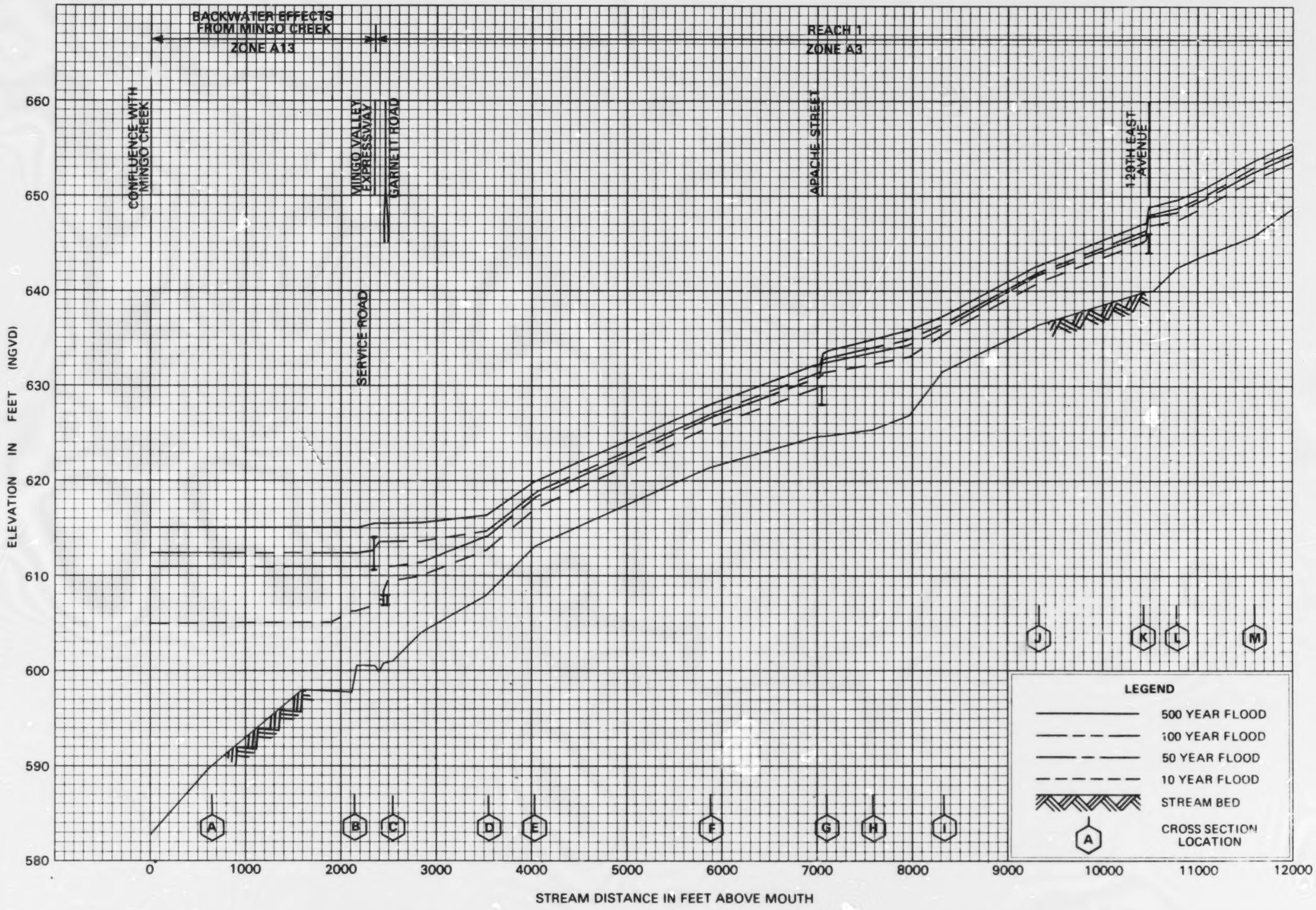


FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

FLOOD PROFILES

LITTLE CREEK



FLOOD PROFILES

QUARRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

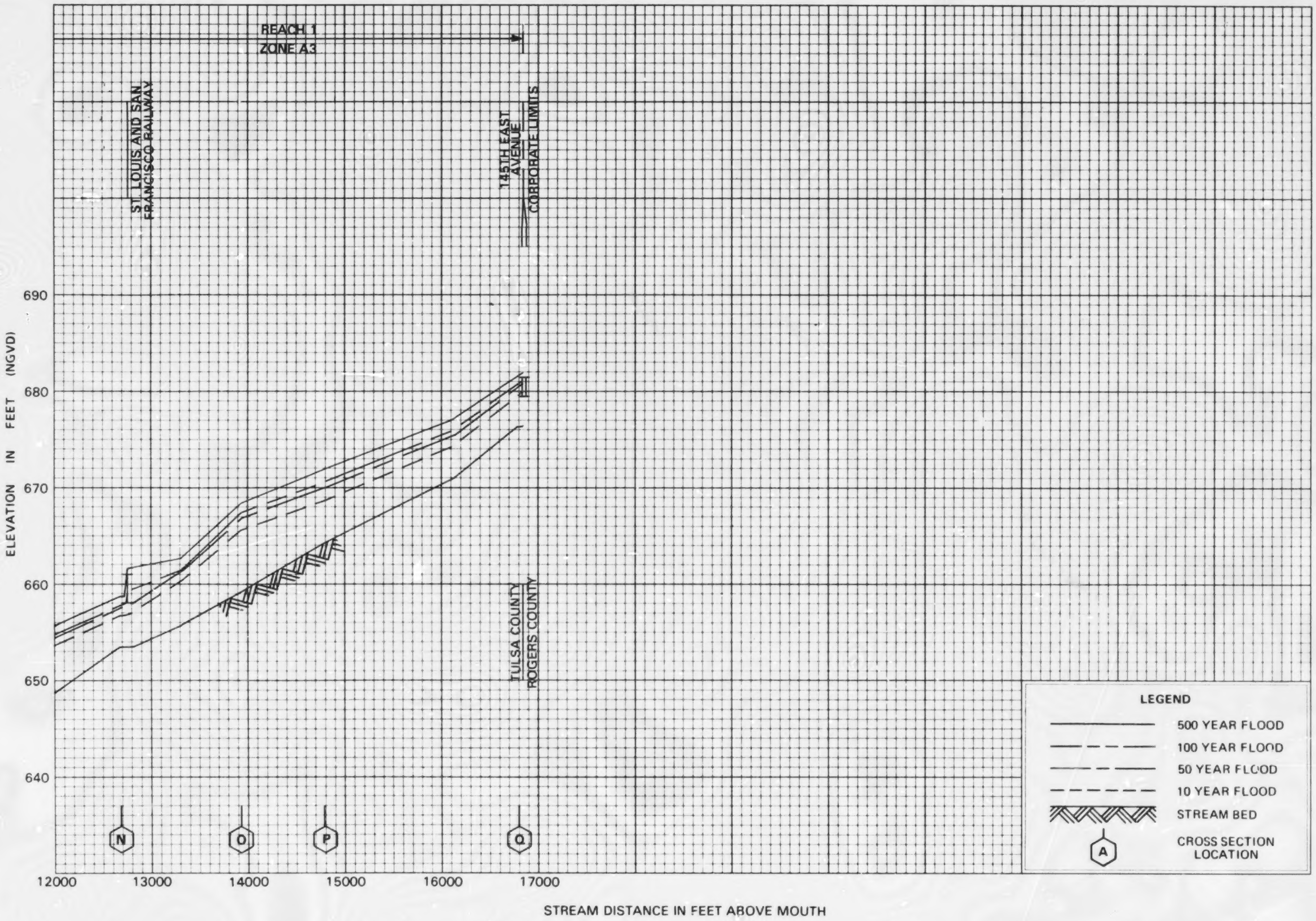
CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

41P

126

BEST COPY AVAILABLE



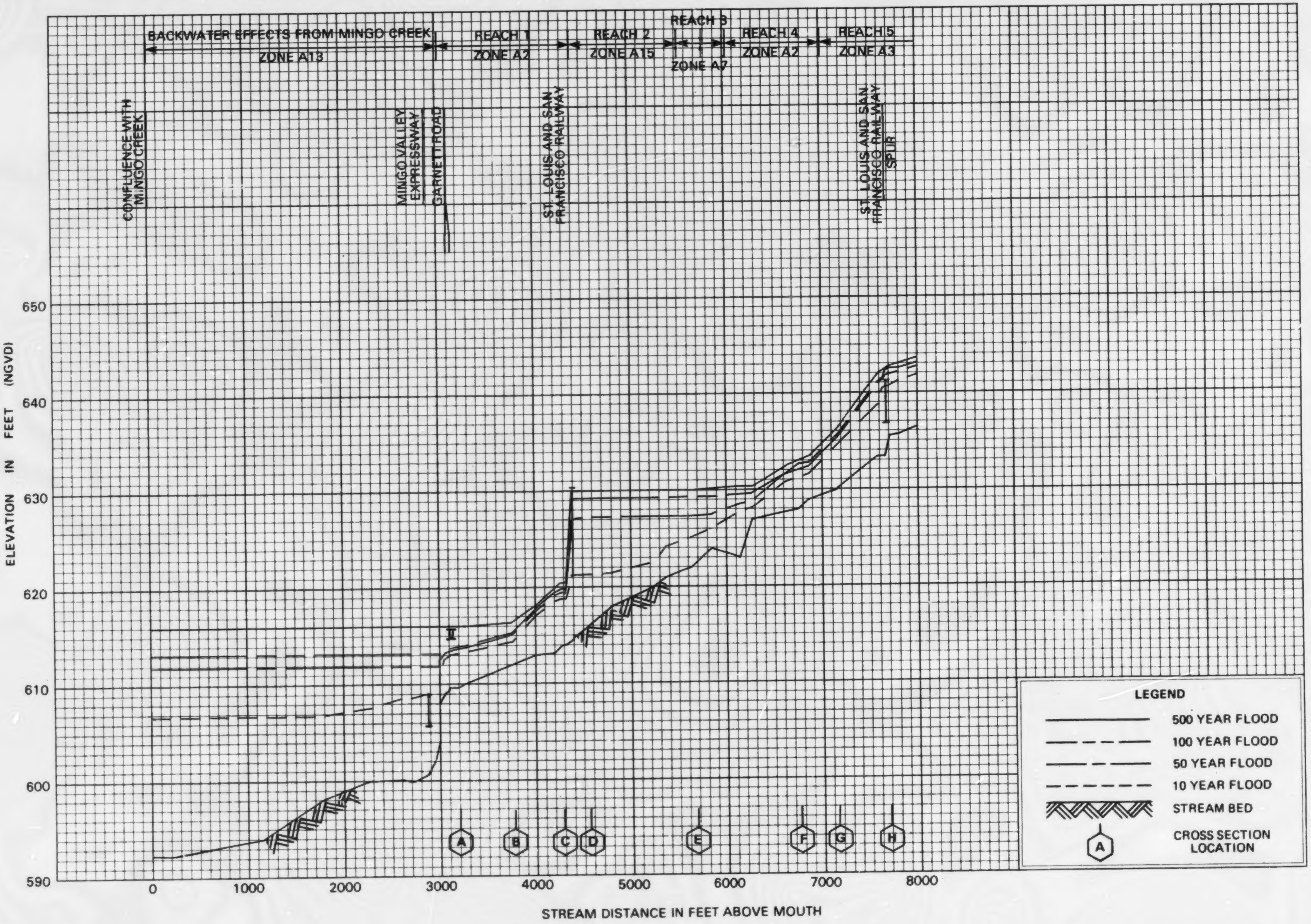
FLOOD PROFILES

QUARRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

42P



FLOOD PROFILES

EAGLE CREEK

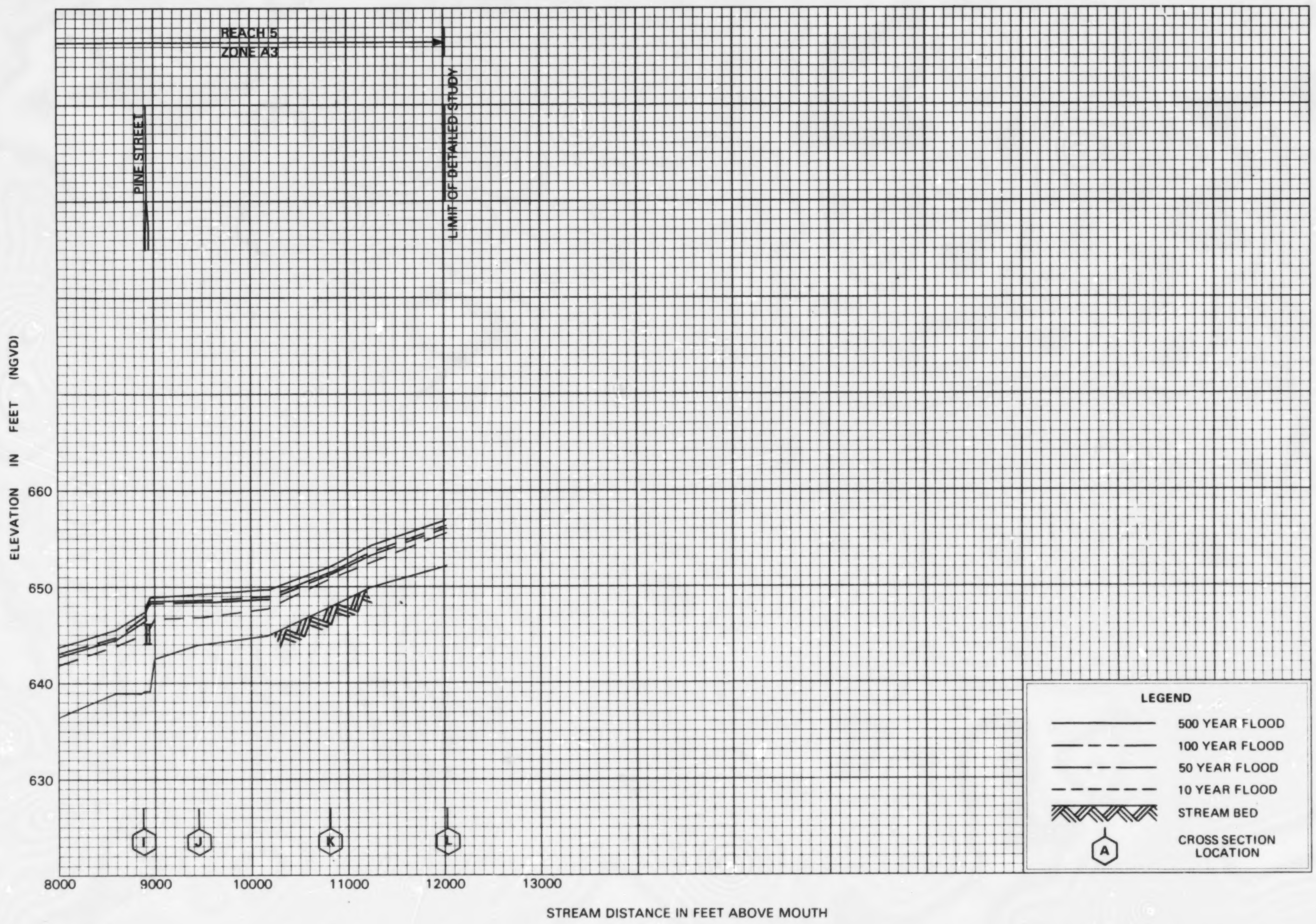
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

43P

138

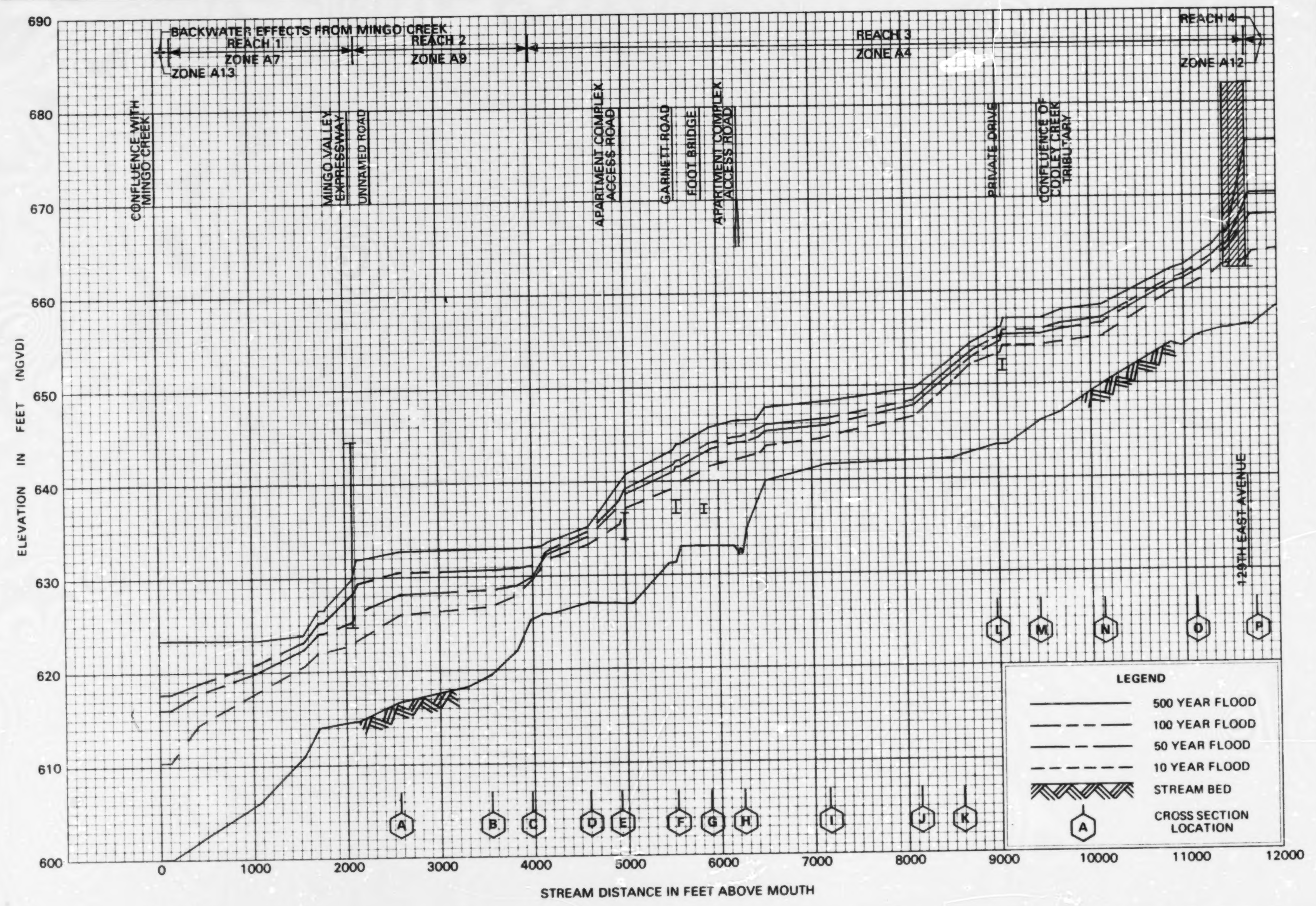


FLOOD PROFILES

EAGLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)



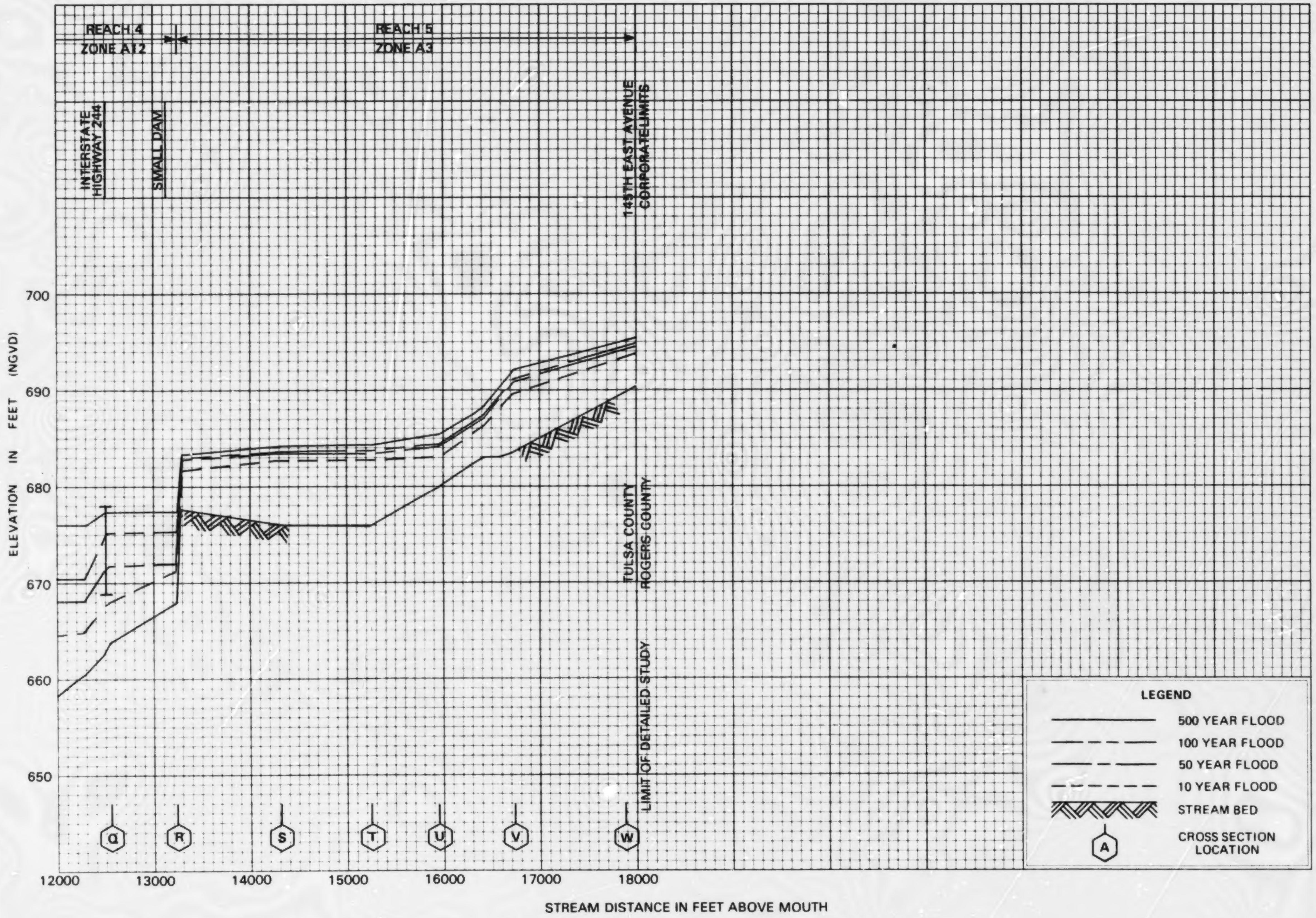
FLOOD PROFILES

COOLEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)



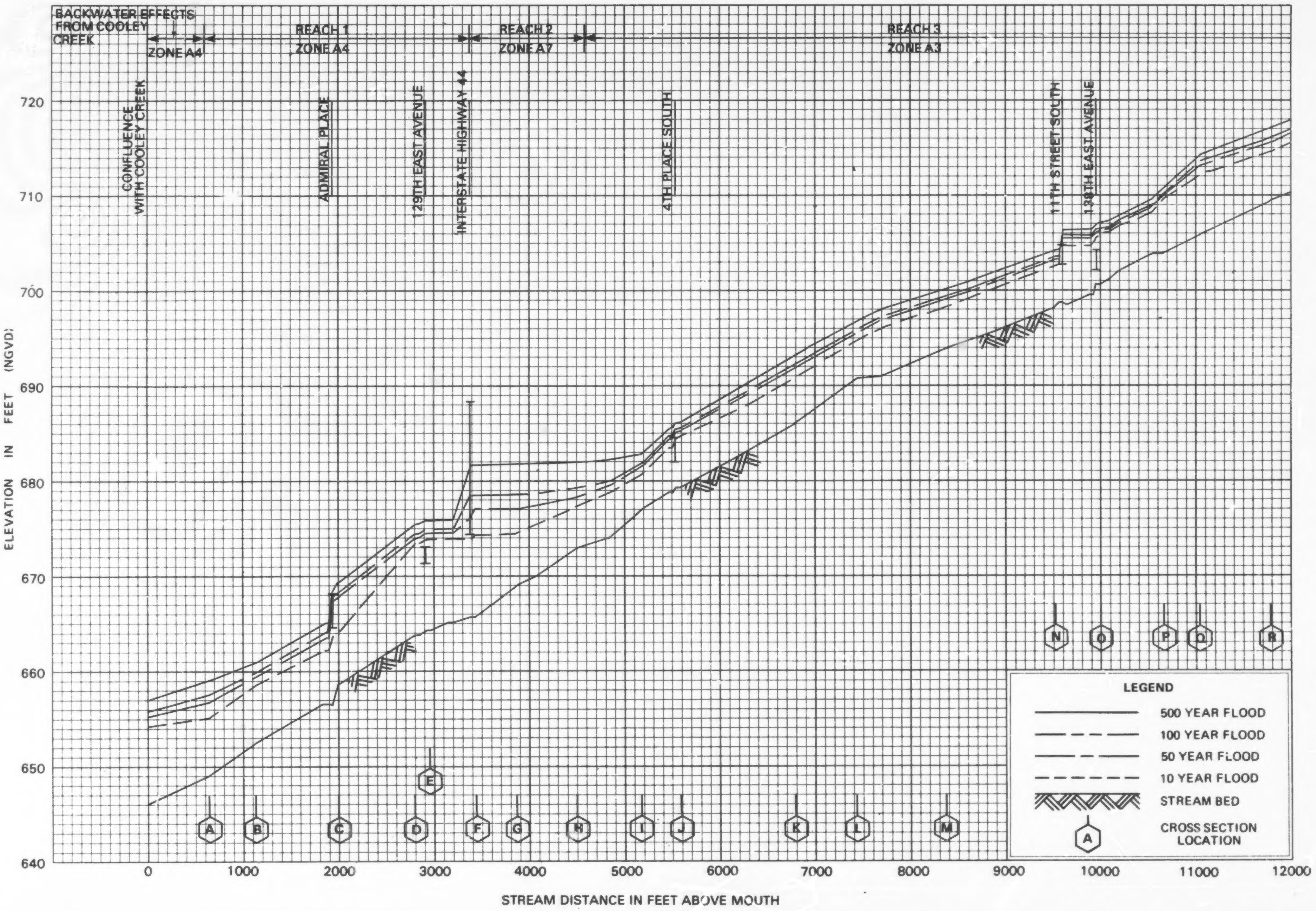
FLOOD PROFILES

COOLEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)



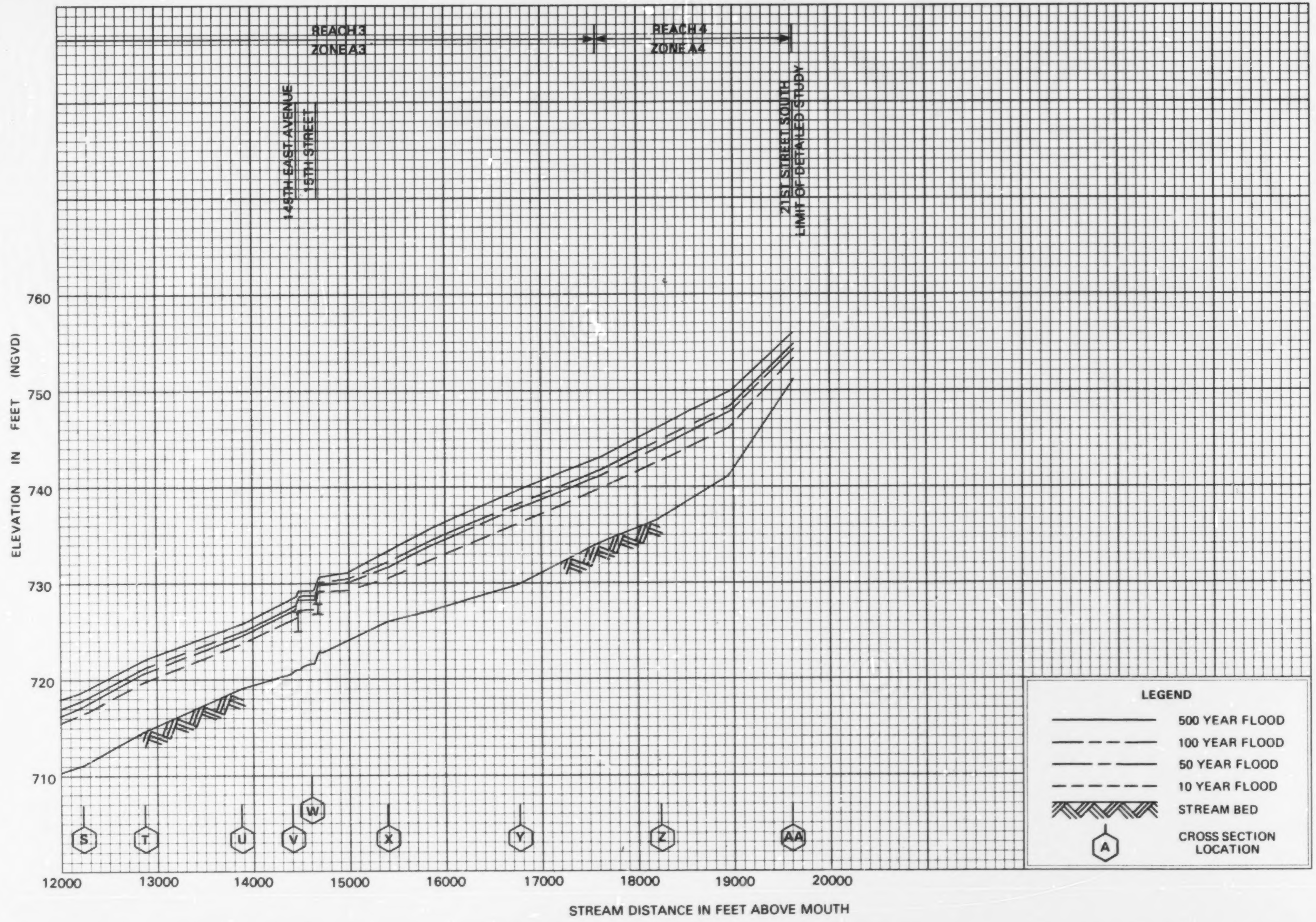
FLOOD PROFILES

COOLEY CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)



FLOOD PROFILES

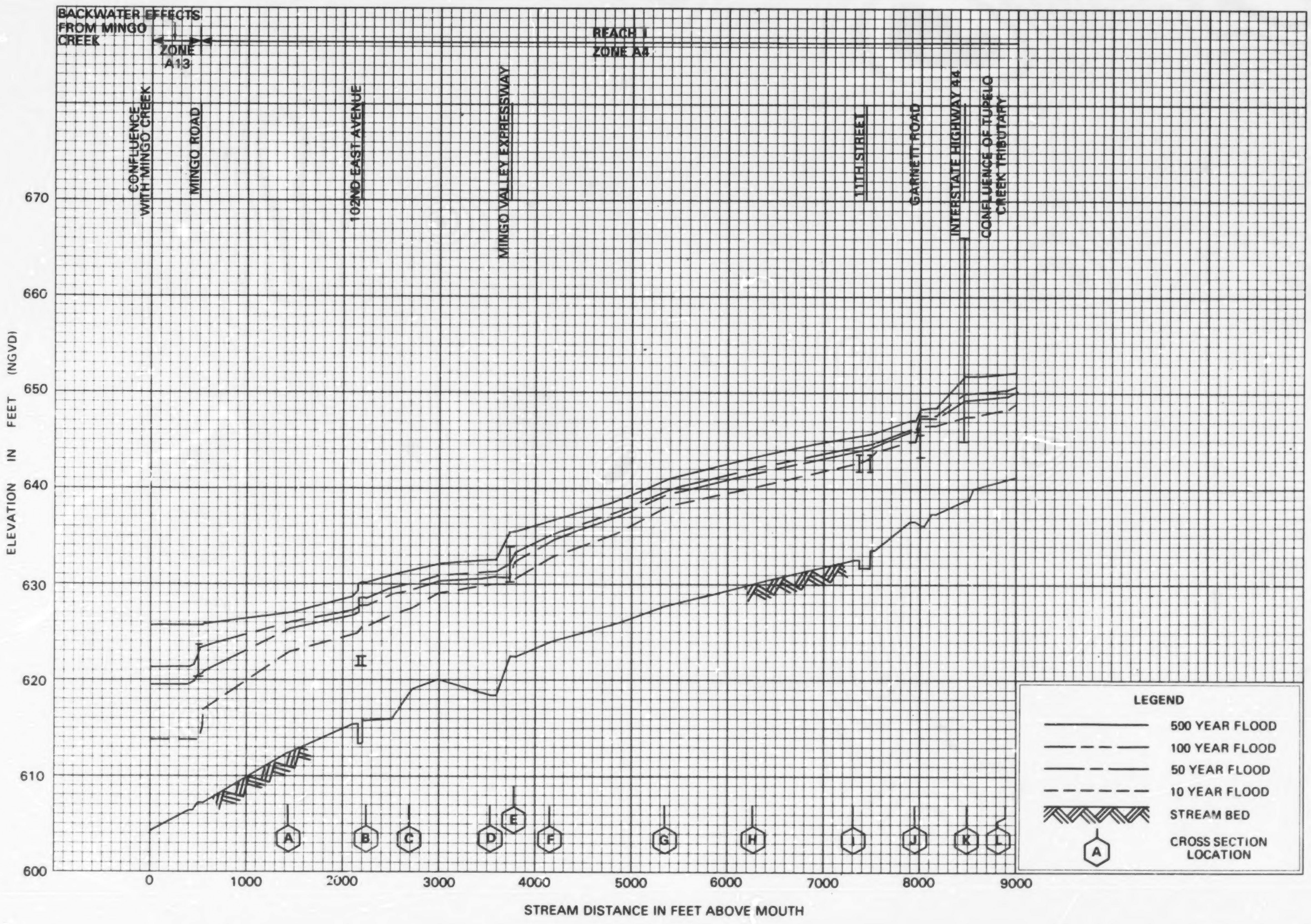
COOLEY CREEK TRIBUARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

48P



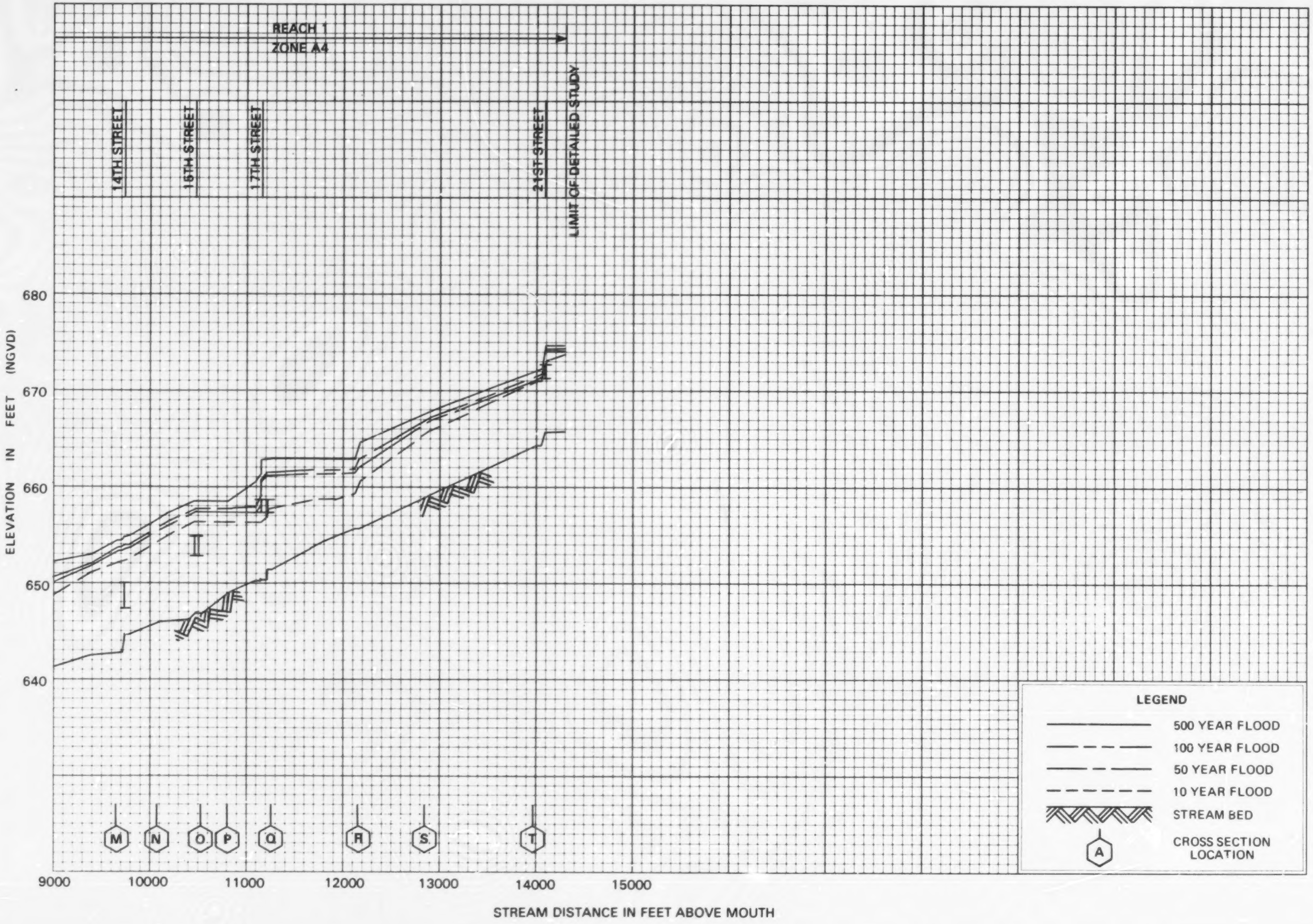
FLOOD PROFILES

TUPELO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

K14



FLOOD PROFILES

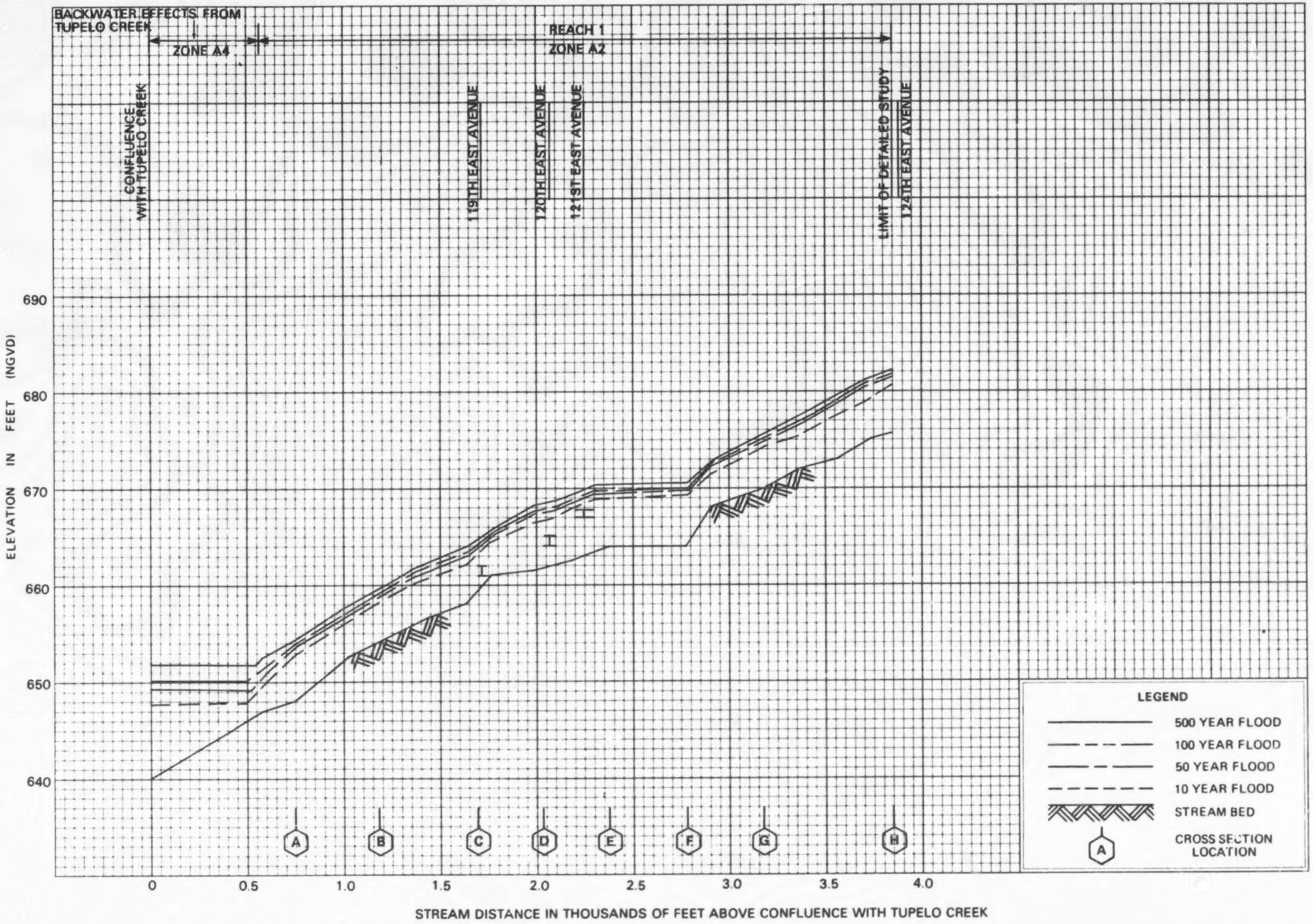
TUPELO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

50P



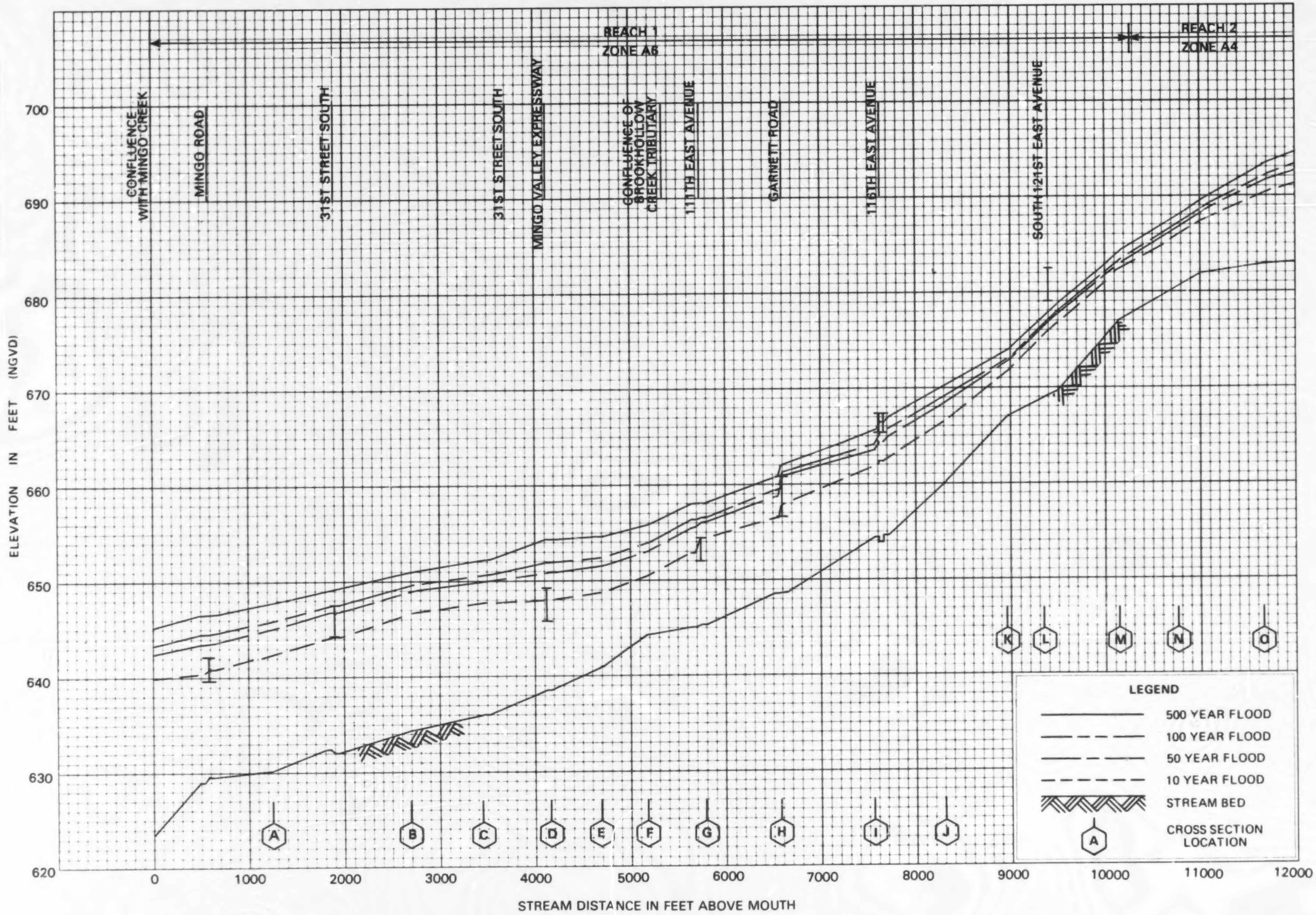
FLOOD PROFILES

TUPELO CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)



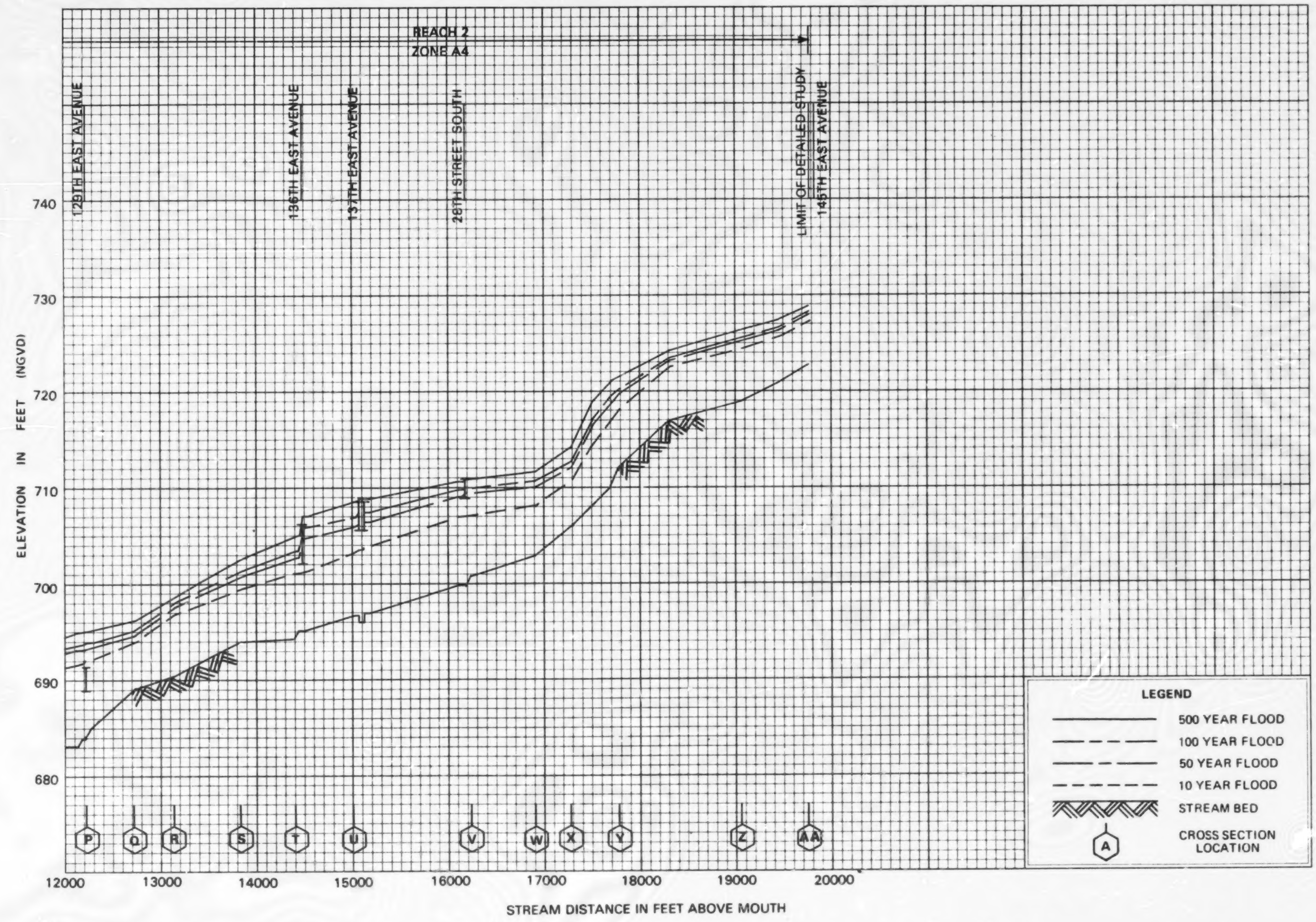
FLOOD PROFILES

BROOKHOLLOW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)



FEDERAL EMERGENCY MANAGEMENT AGENCY

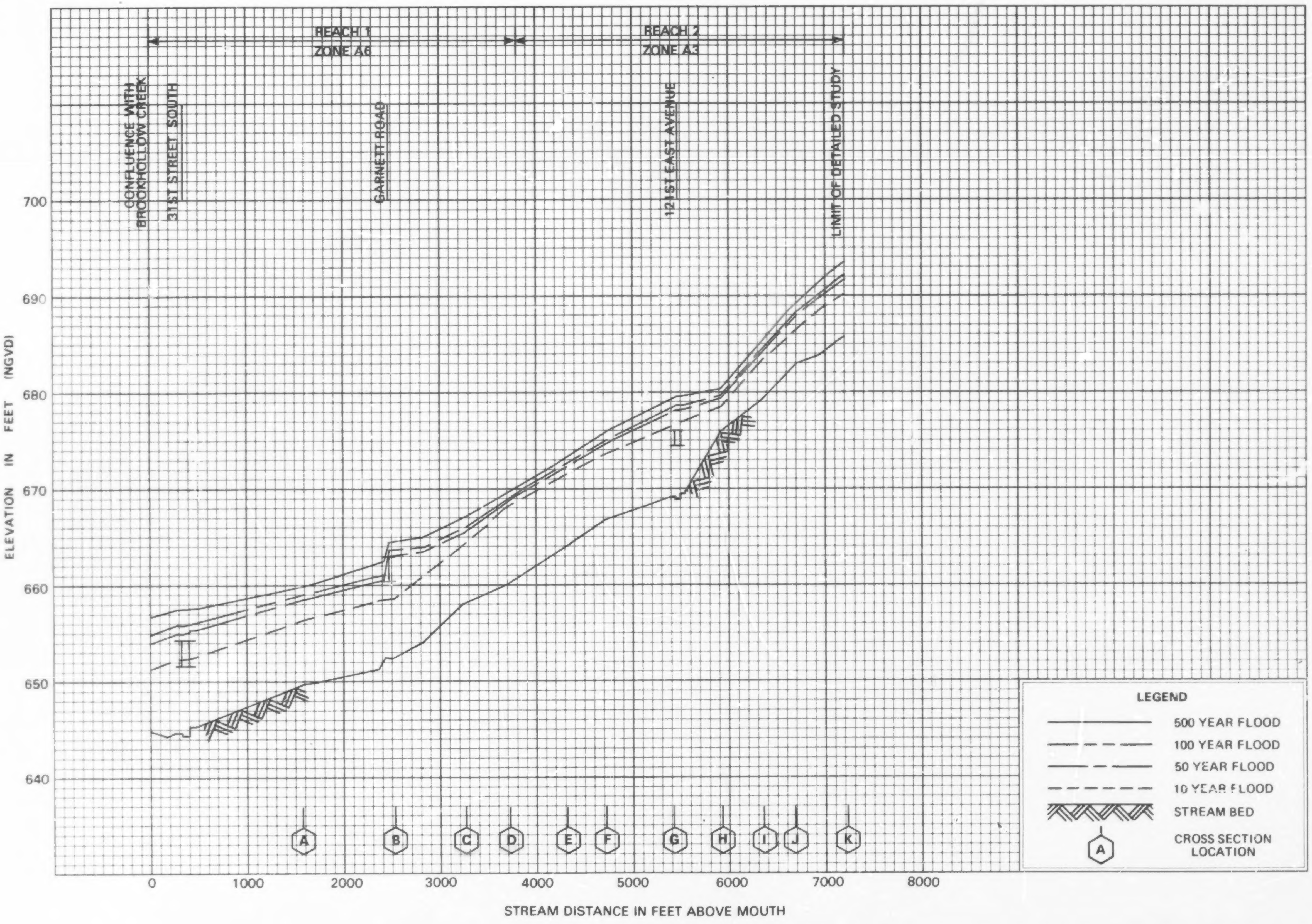
CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

FLOOD PROFILES

BROOKHOLLOW CREEK

53P

118



FLOOD PROFILES

BROOKHOLLOW CREEK TRIBUTARY

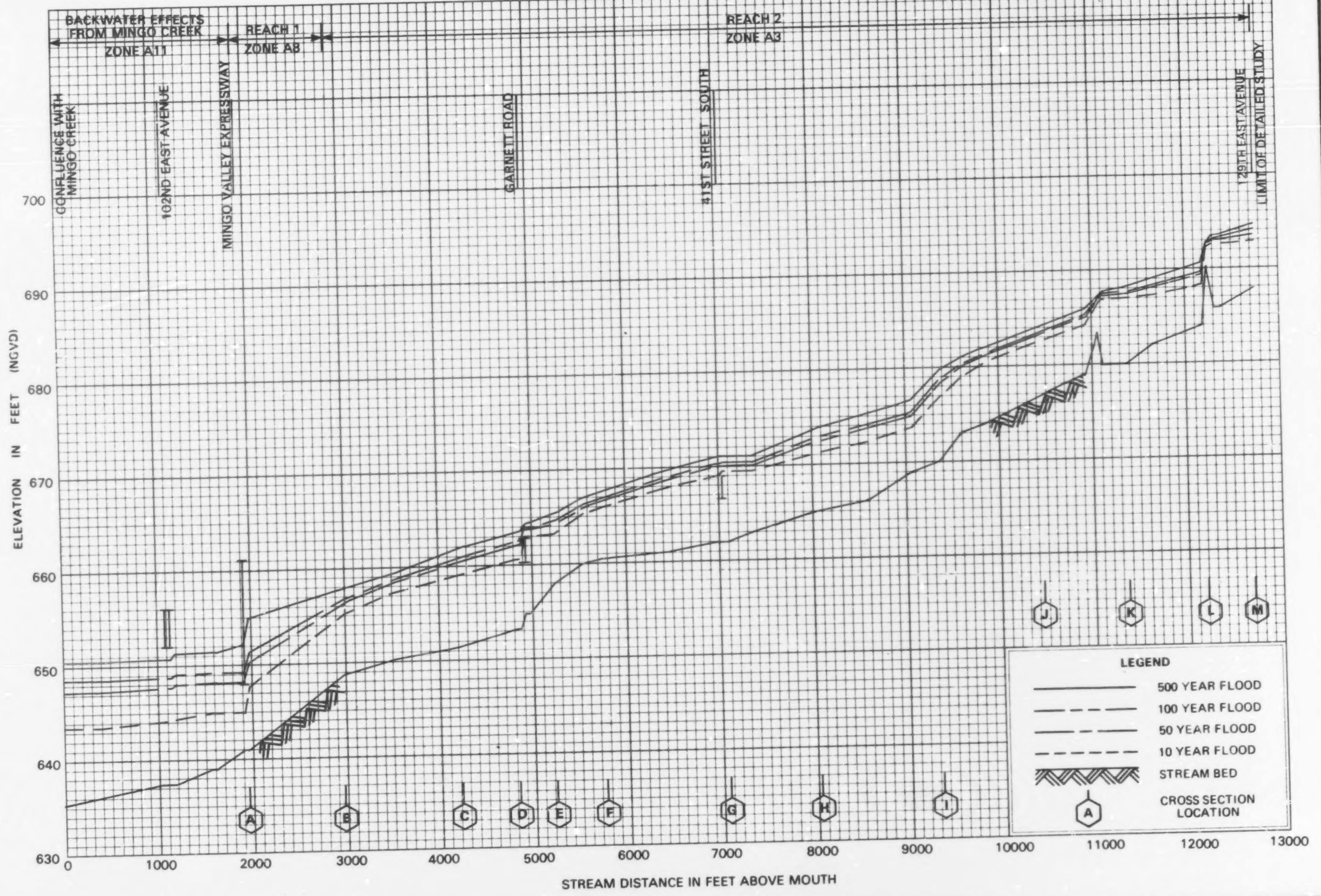
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

54P

WG



FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

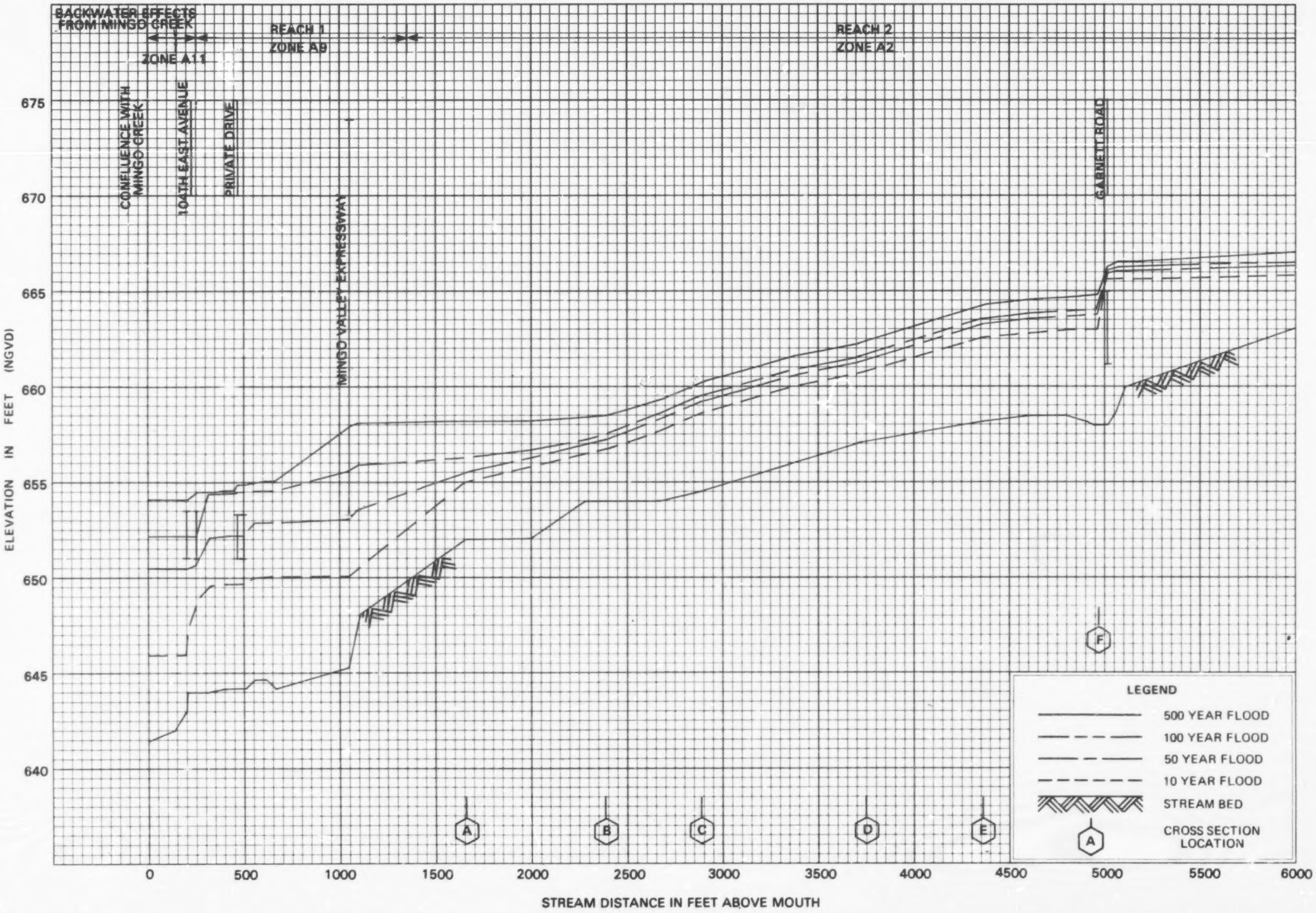
(TULSA, OSAGE, AND ROGERS COS.)

FLOOD PROFILES

SUGAR CREEK

55P

150



FLOOD PROFILES

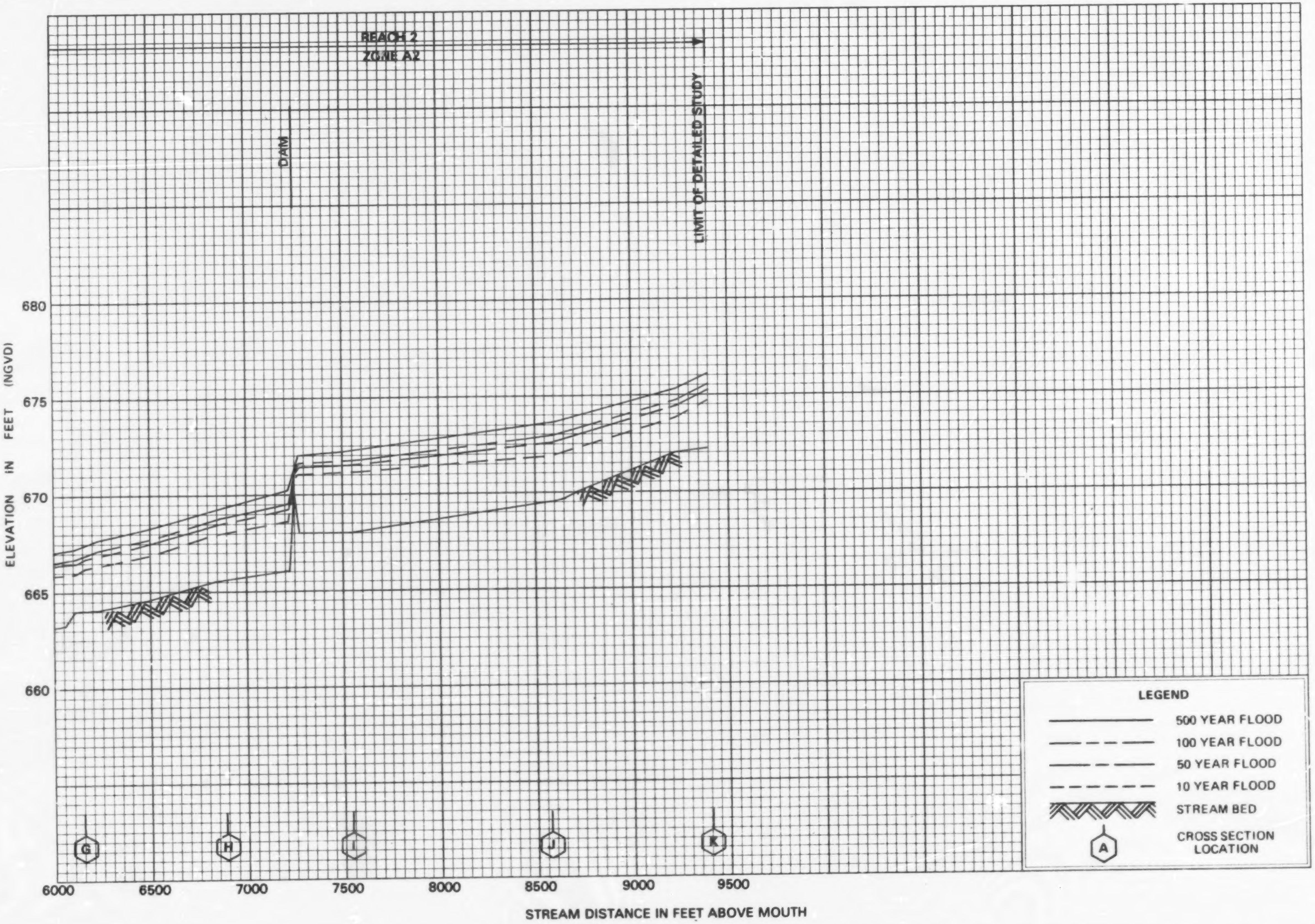
SOUTHPARK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

56P

157



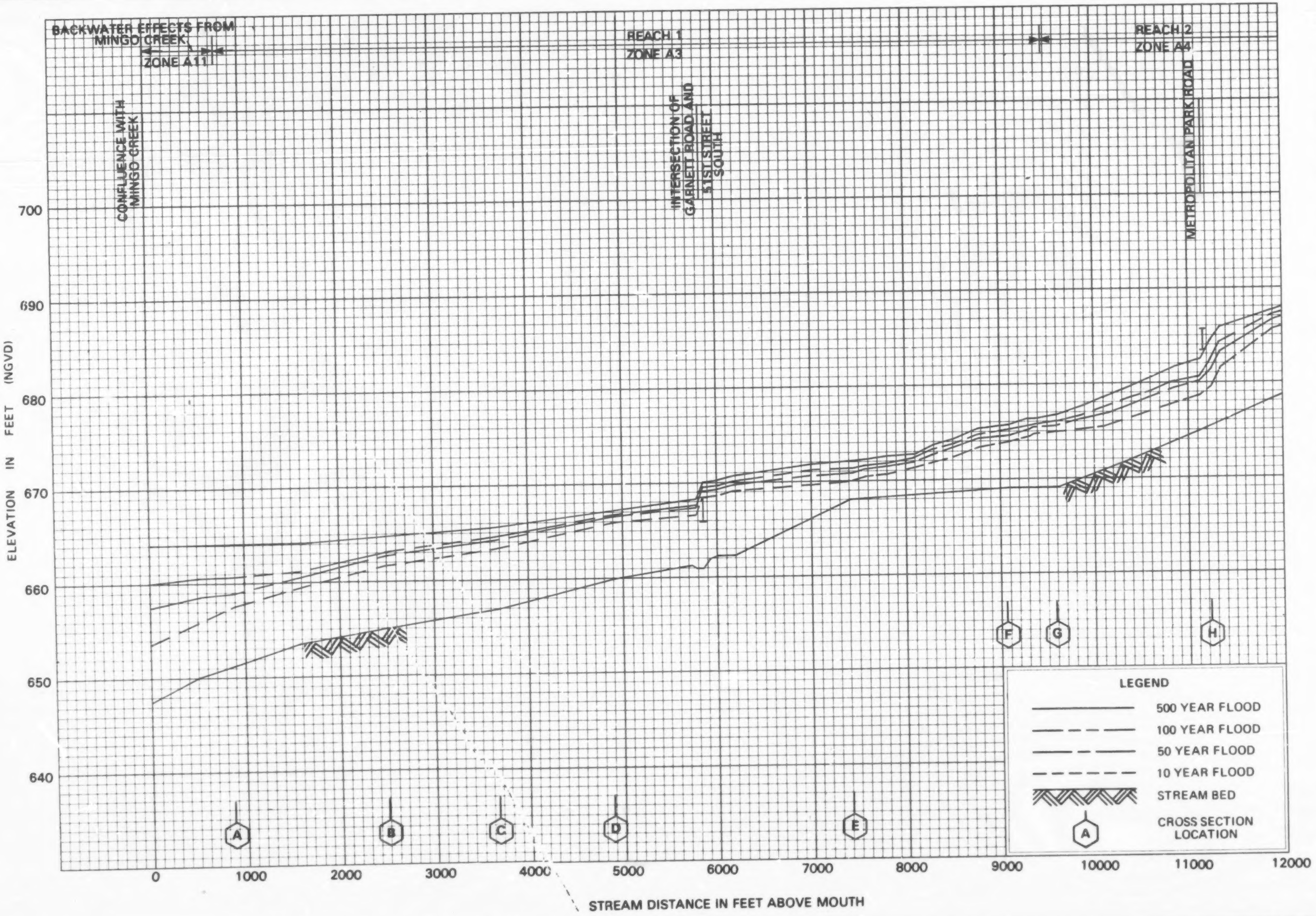
FLOOD PROFILES

SOUTHPARK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

57P



FLOOD PROFILES

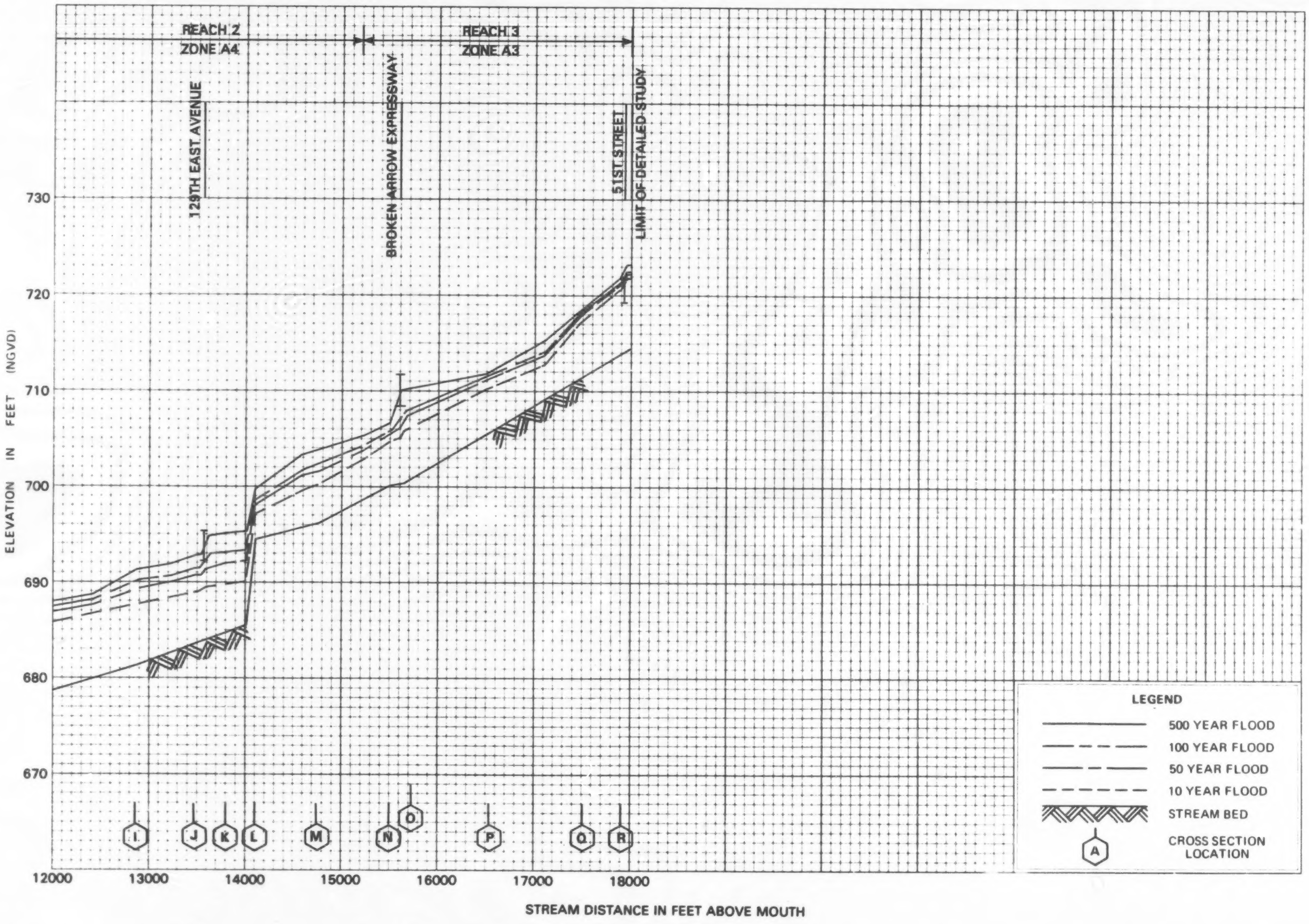
FORD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

58P

163



FLOOD PROFILES

FORD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

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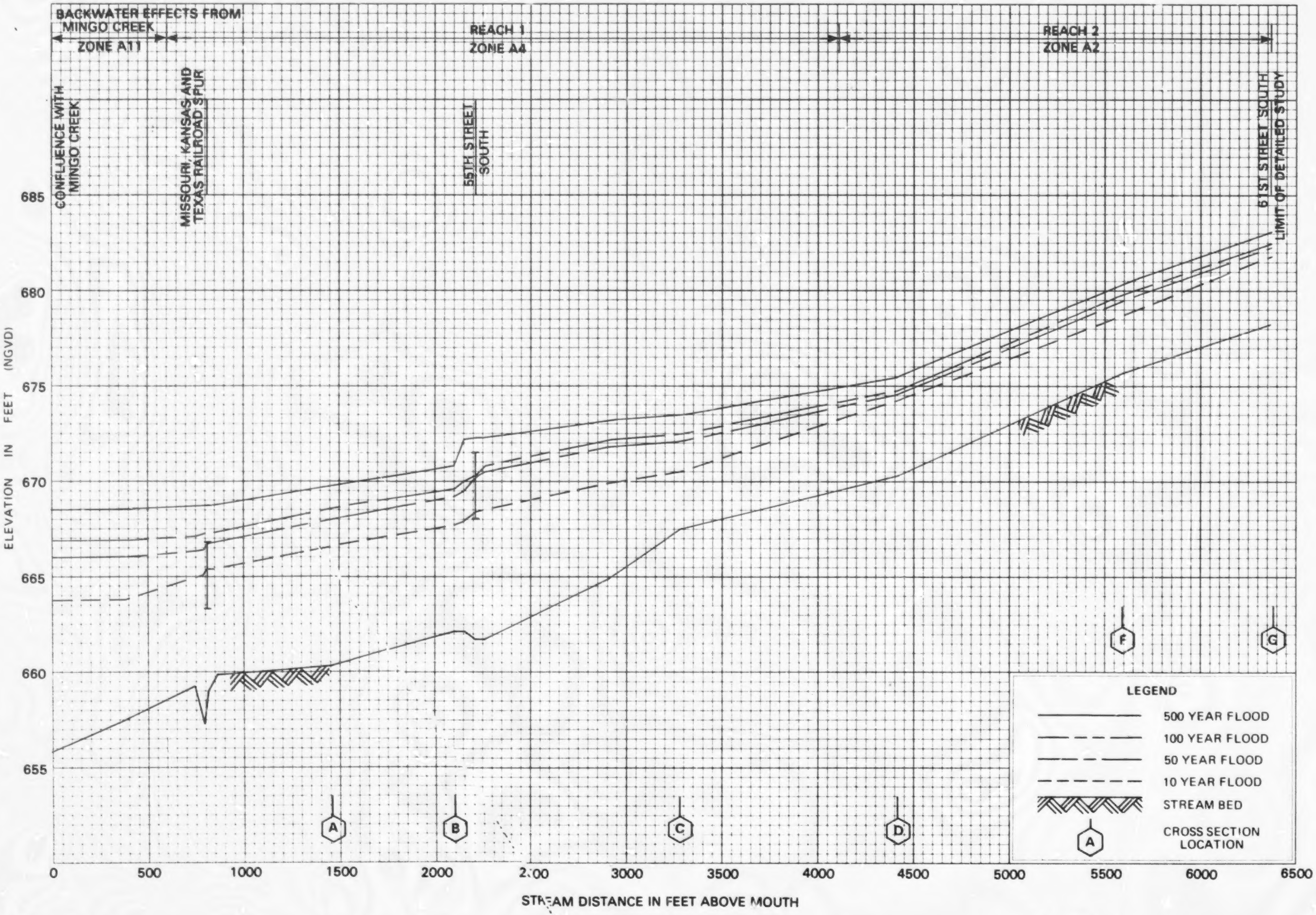


FLOOD PROFILES

CATFISH CREEK

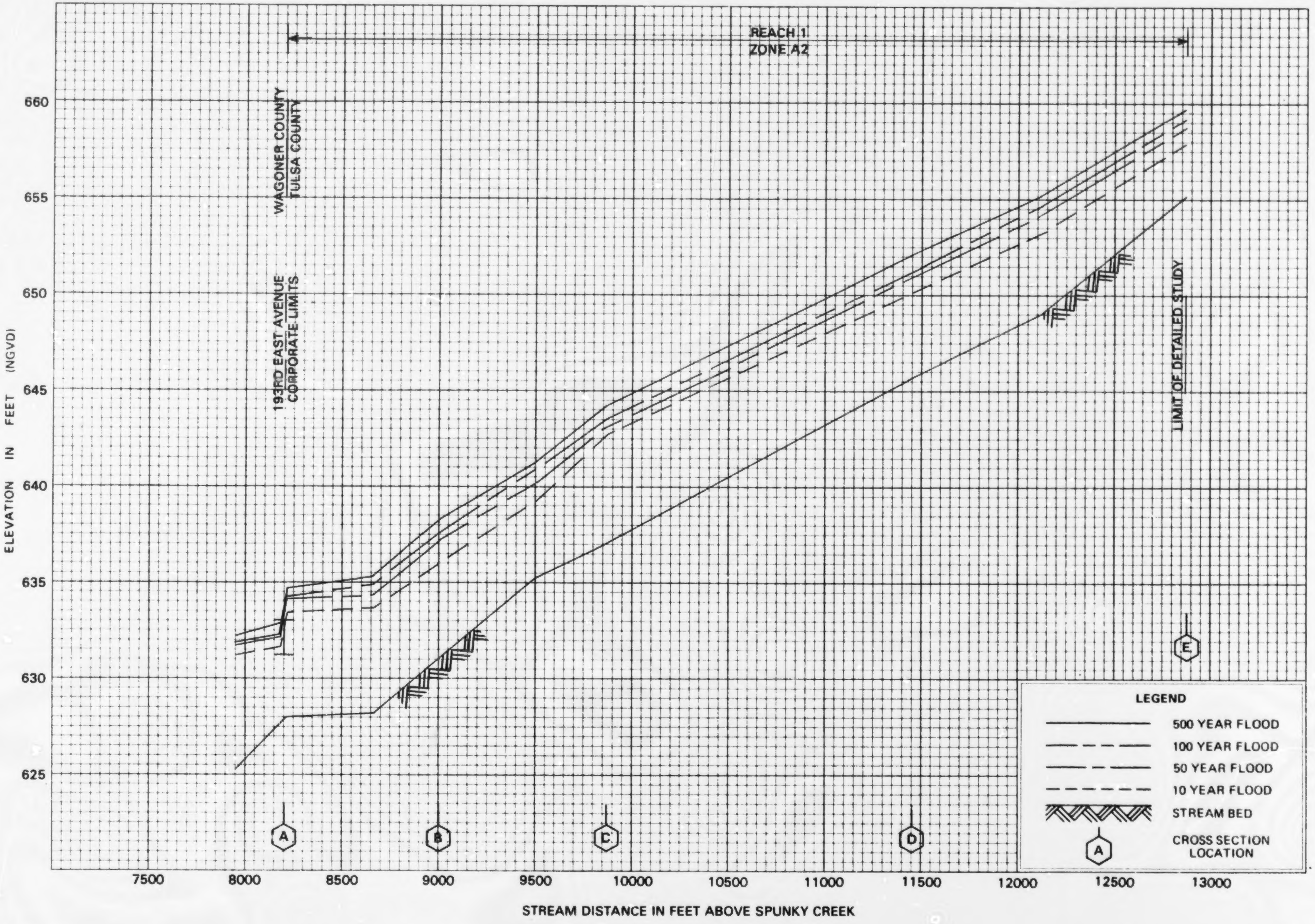
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

60P

156



FLOOD PROFILES

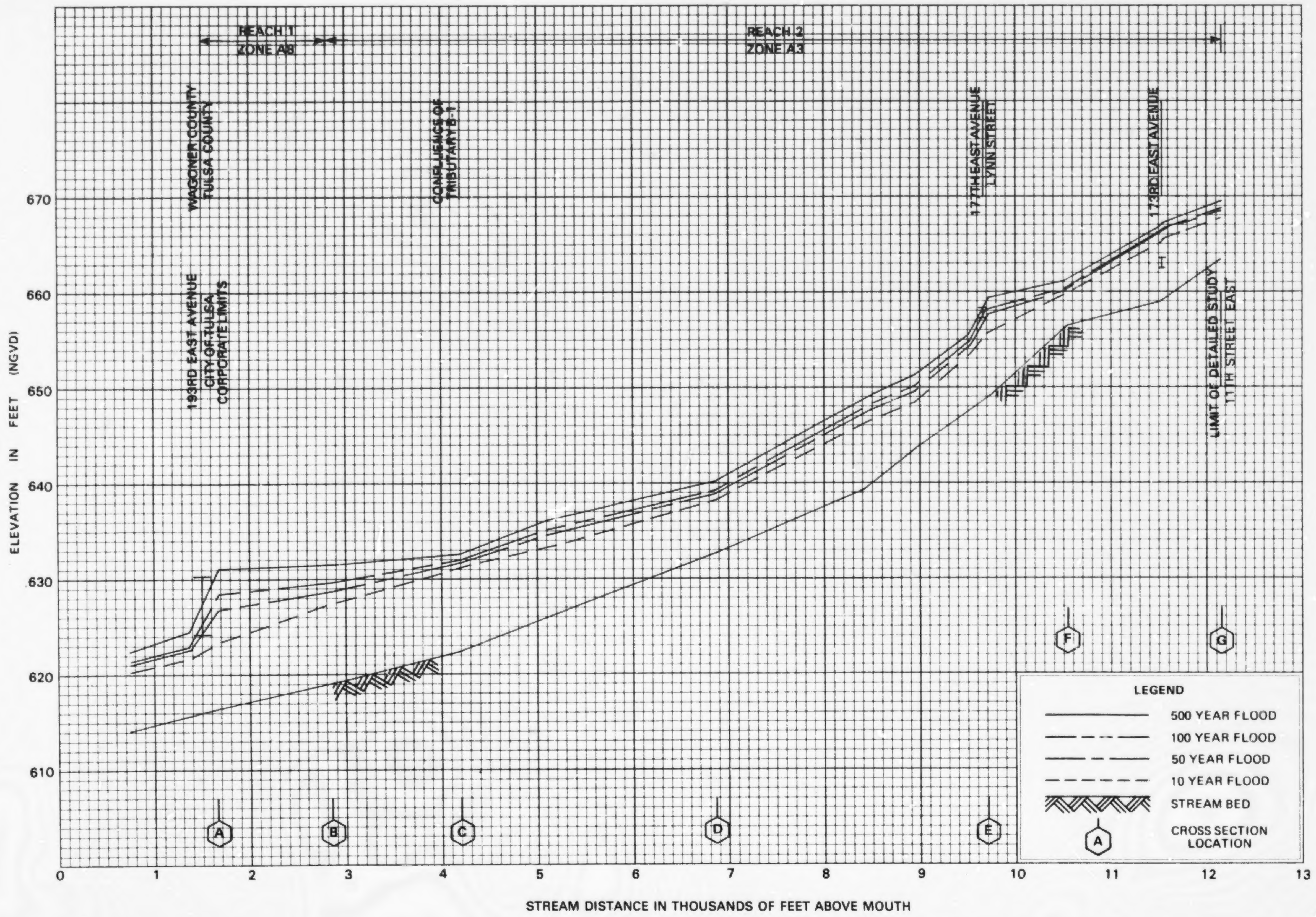
SPUNKY CREEK TRIBUARY A

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

61P



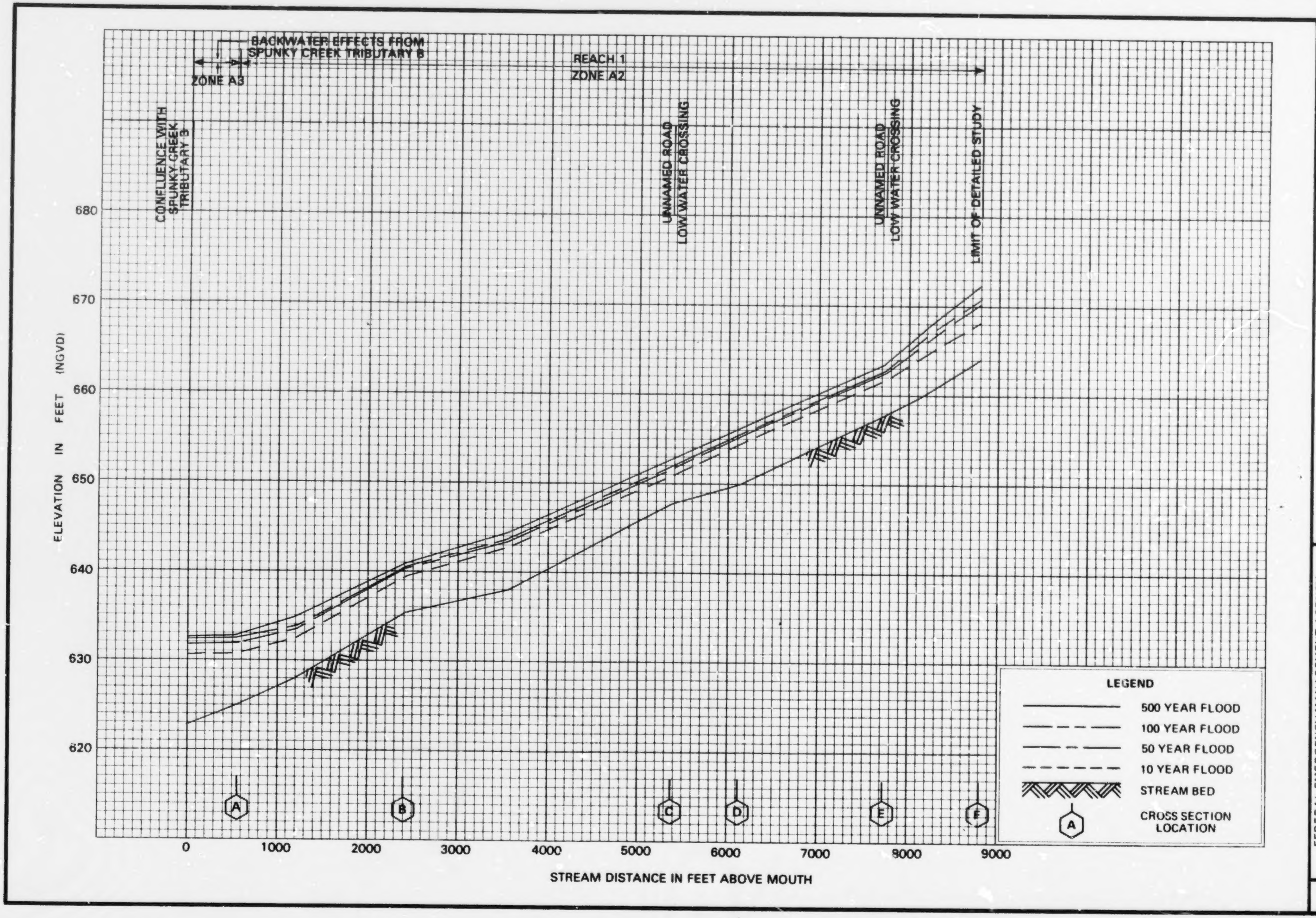
FLOOD PROFILES

SPUNKY CREEK TRIBUTARY B

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

157



FLOOD PROFILES

SPUNKY CREEK TRIBUTARY B-1

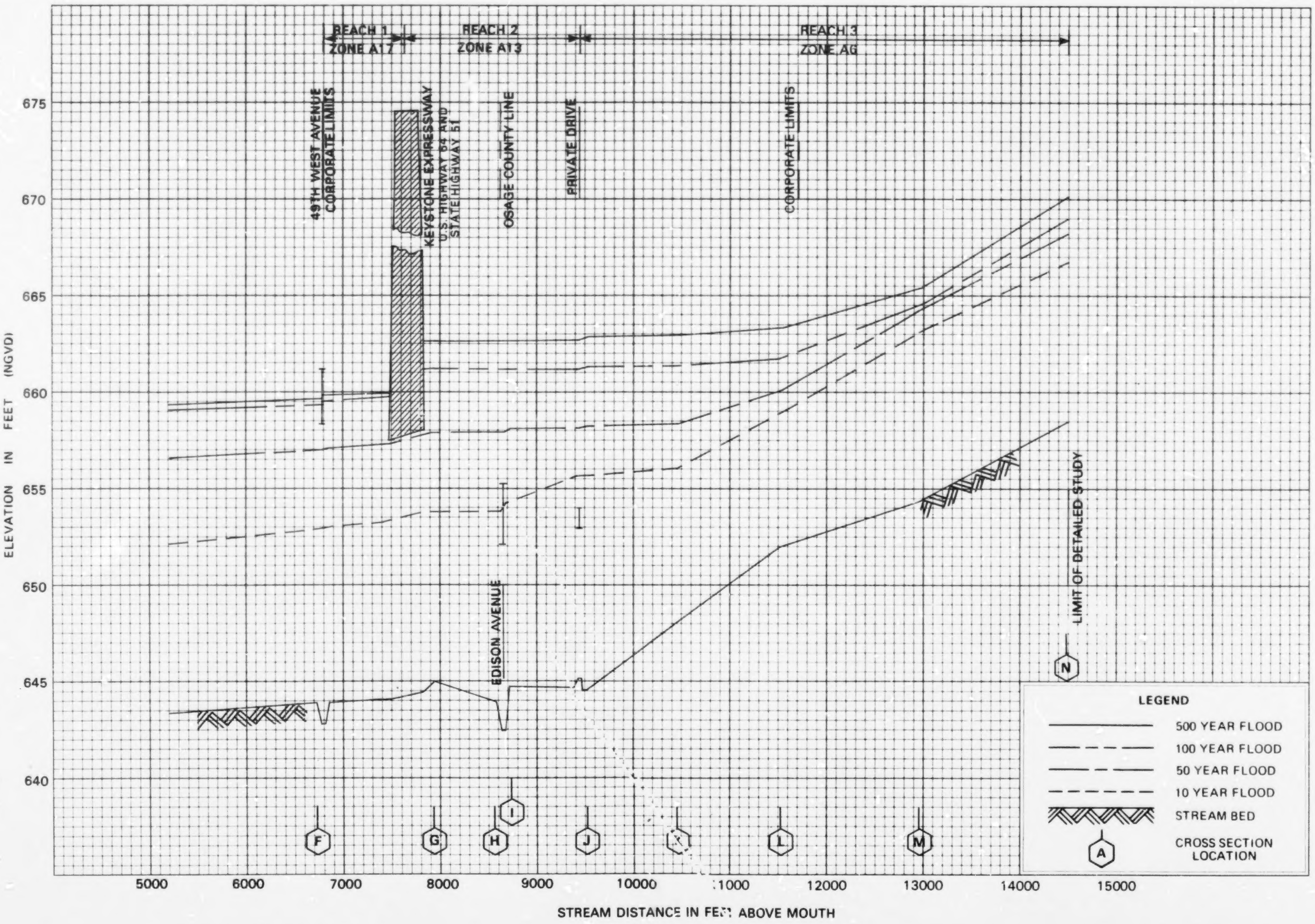
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

63P

158



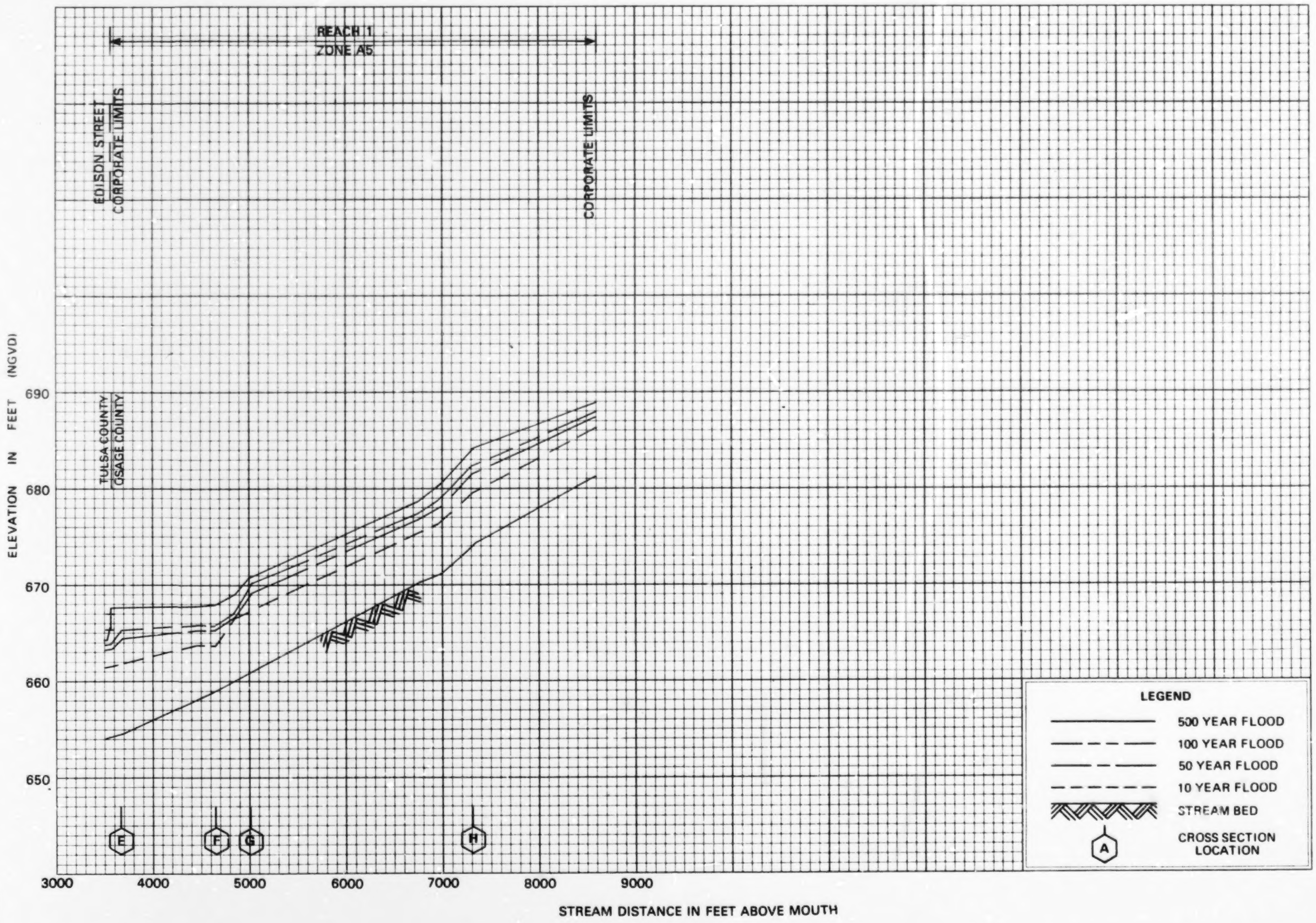
FLOOD PROFILES

HARLOW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

64P



FLOOD PROFILES

HARLOW CREEK TRIBUTARY

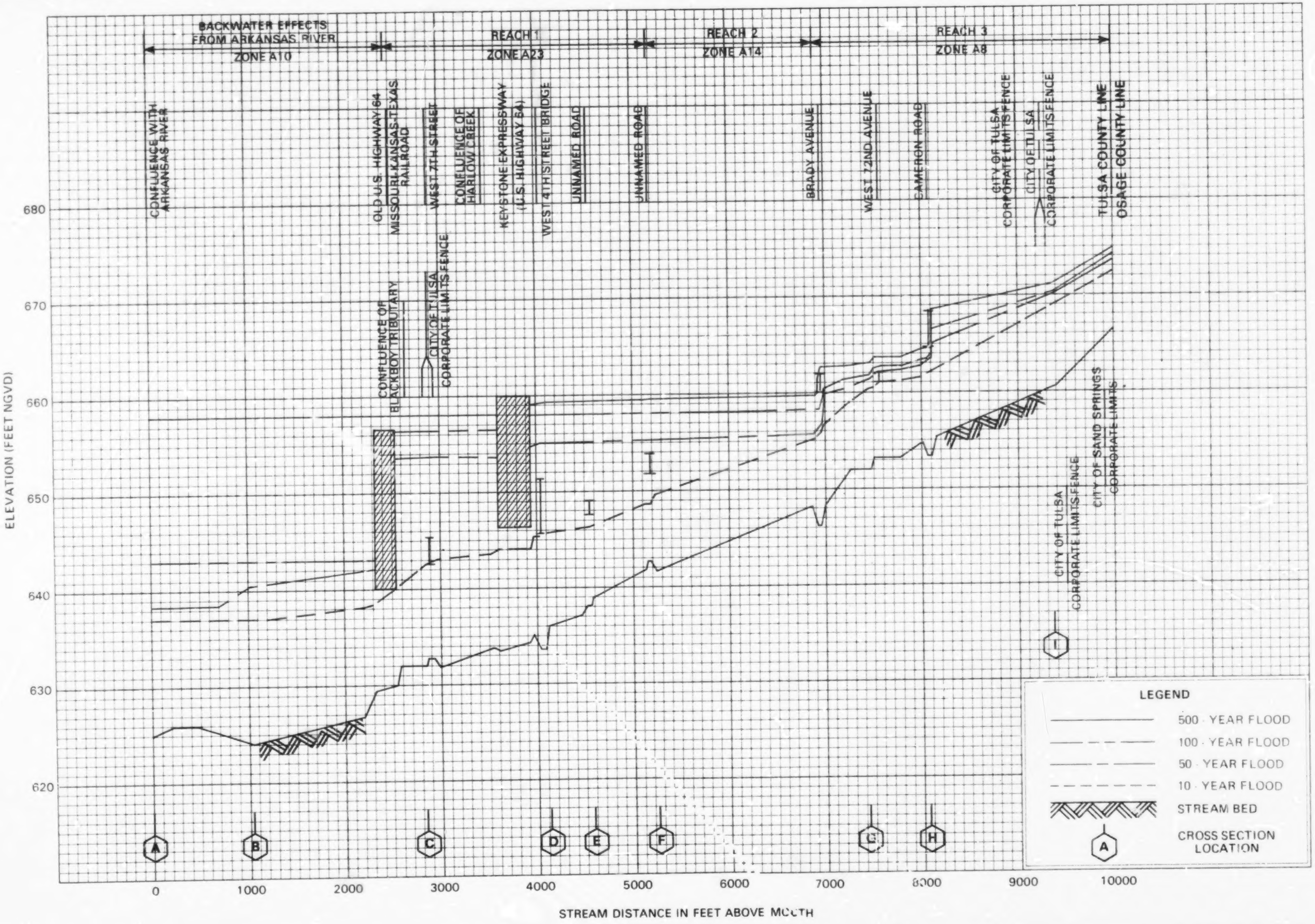
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

65P

160



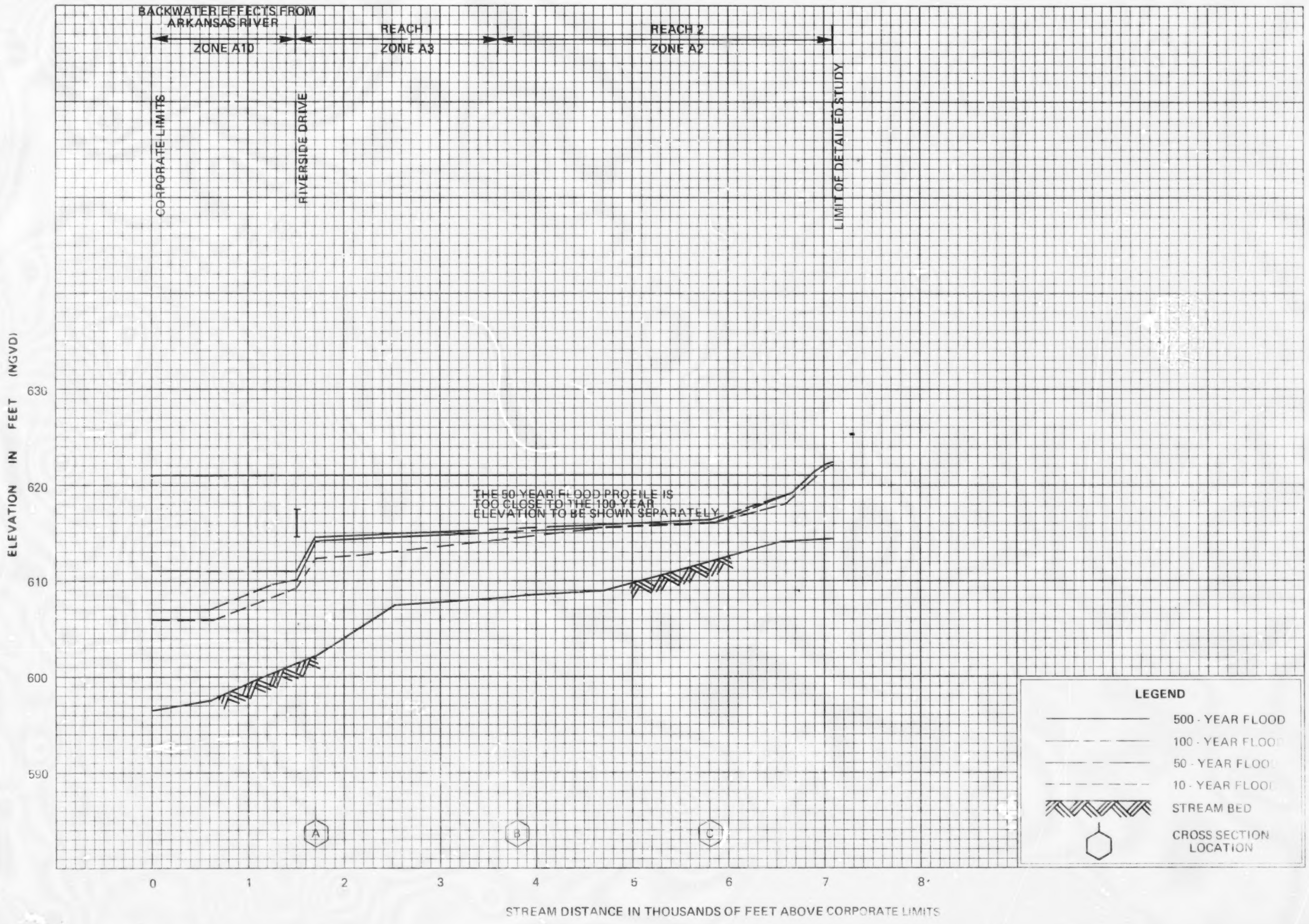
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

FLOOD PROFILES

BLACKBOY CREEK



FLOOD PROFILES

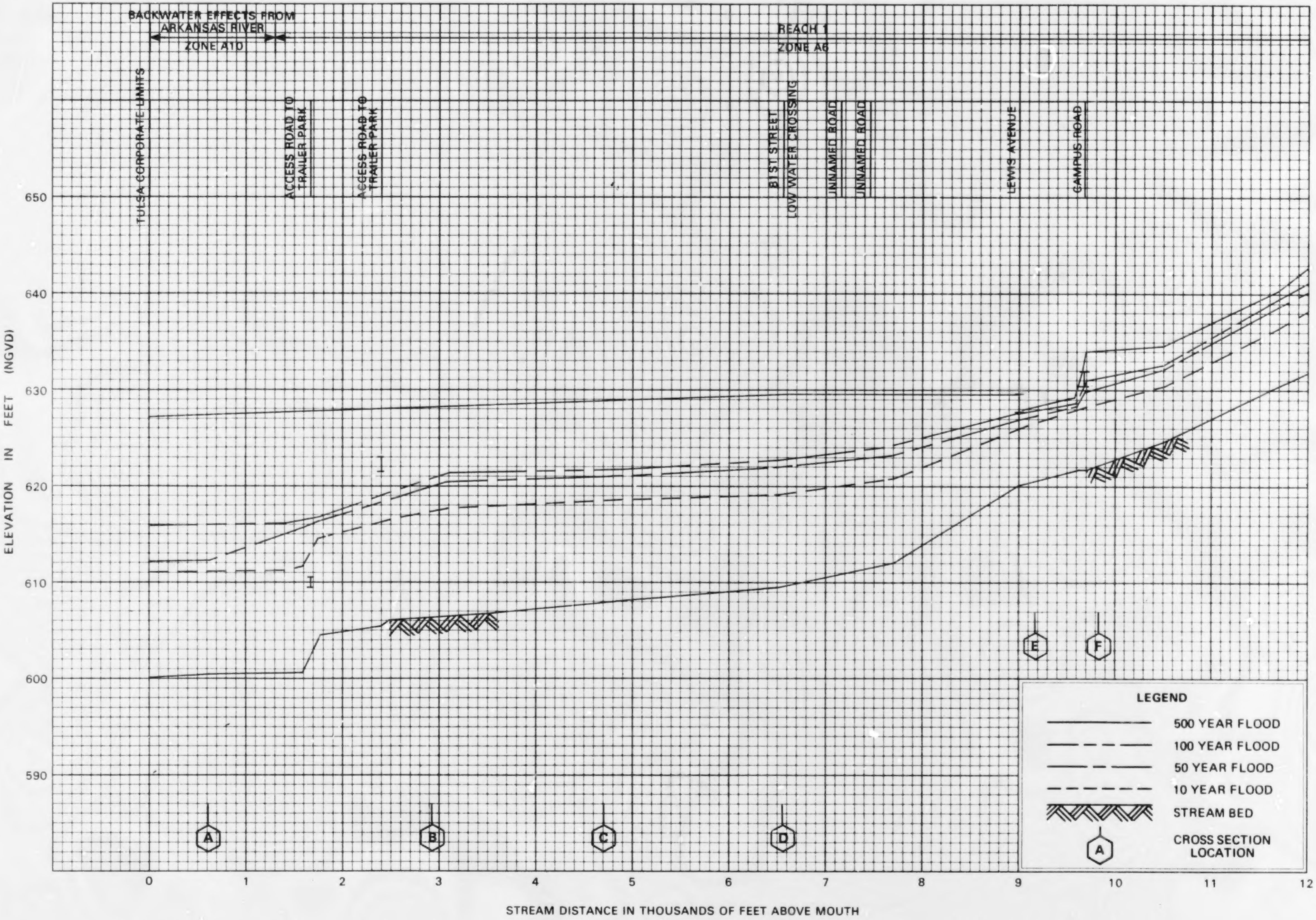
VENSEL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

67P



FLOOD PROFILES

FRED CREEK

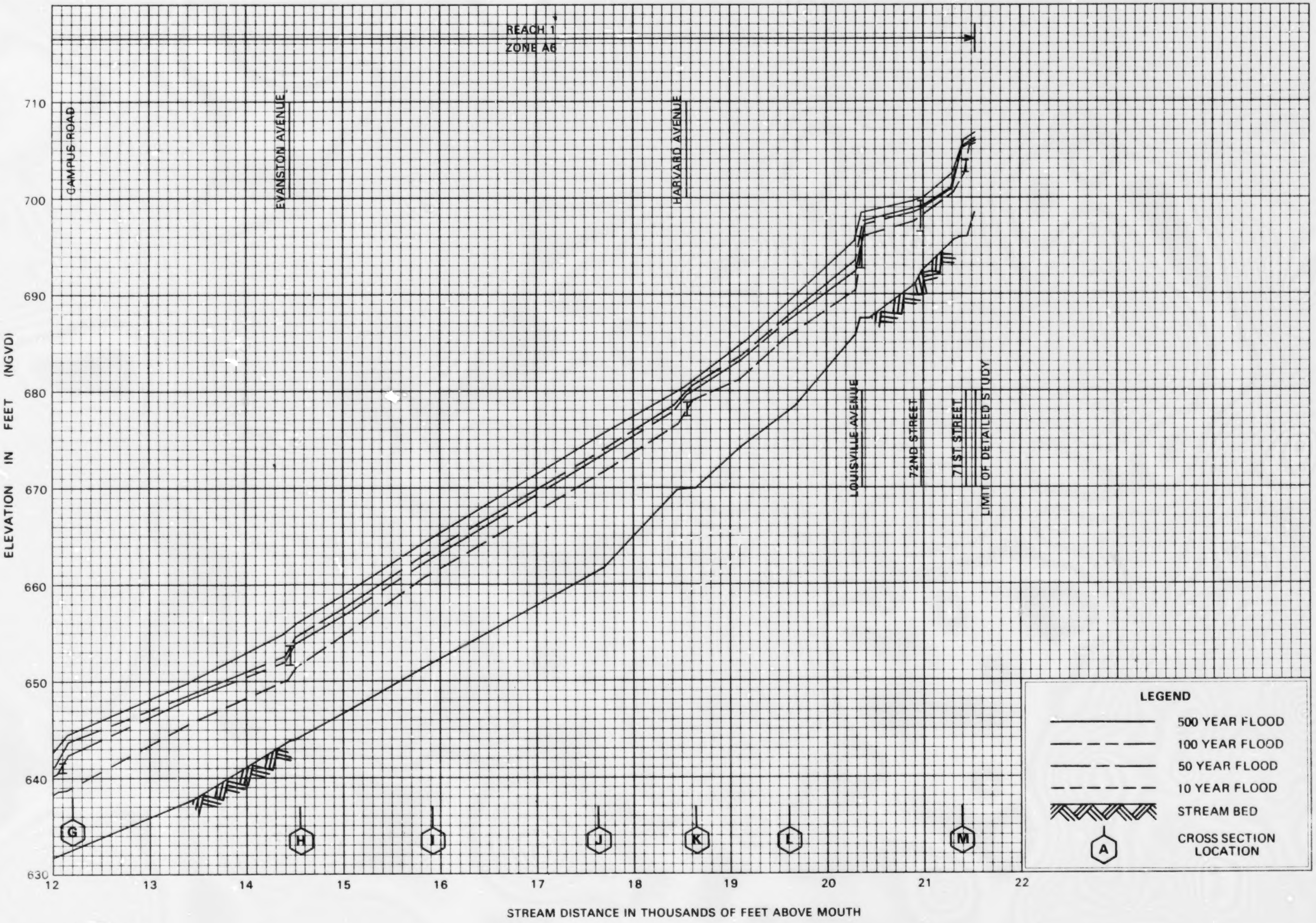
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

68P

163



FLOOD PROFILES

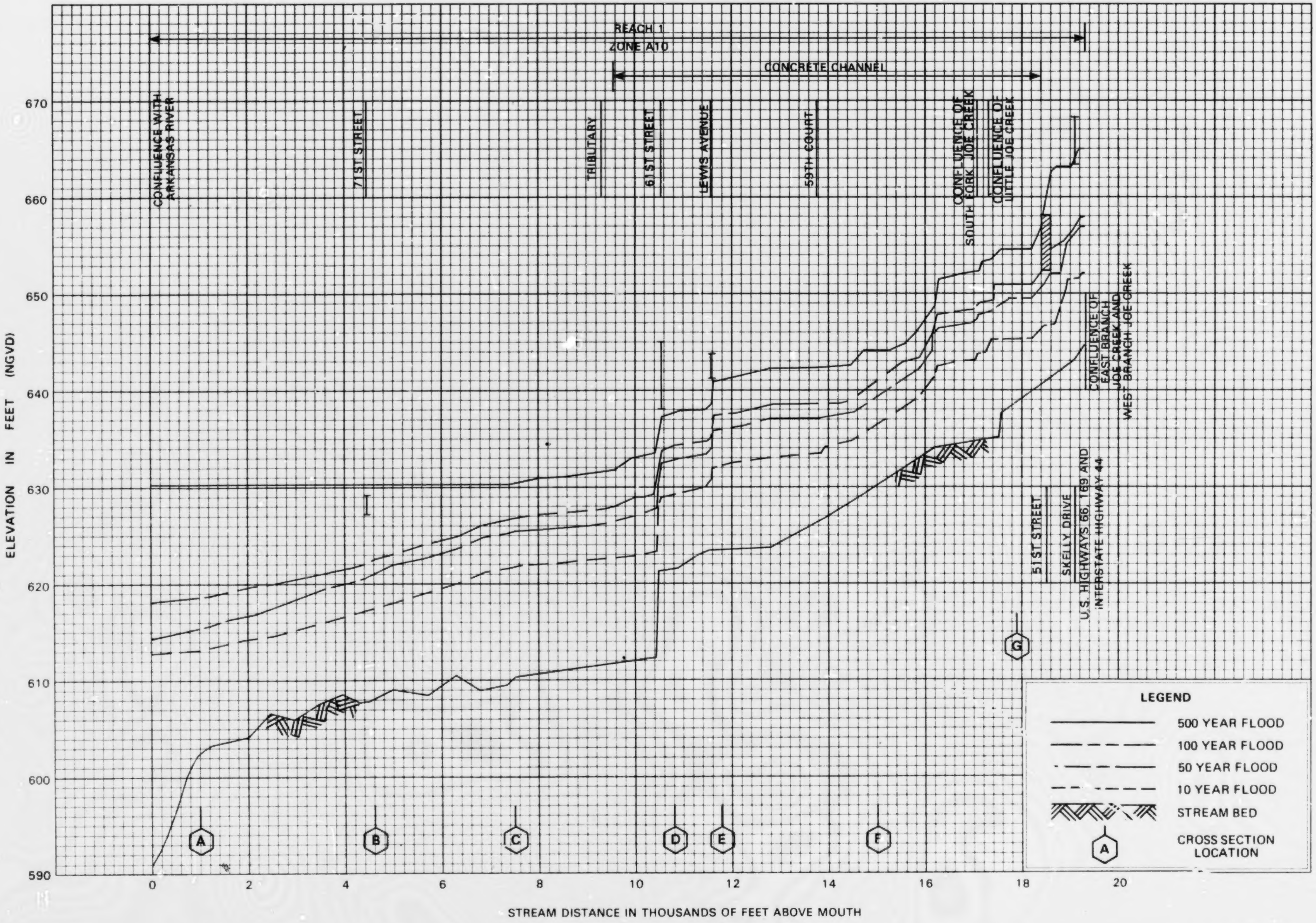
FRED CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

69P



FLOOD PROFILES

JOE CREEK

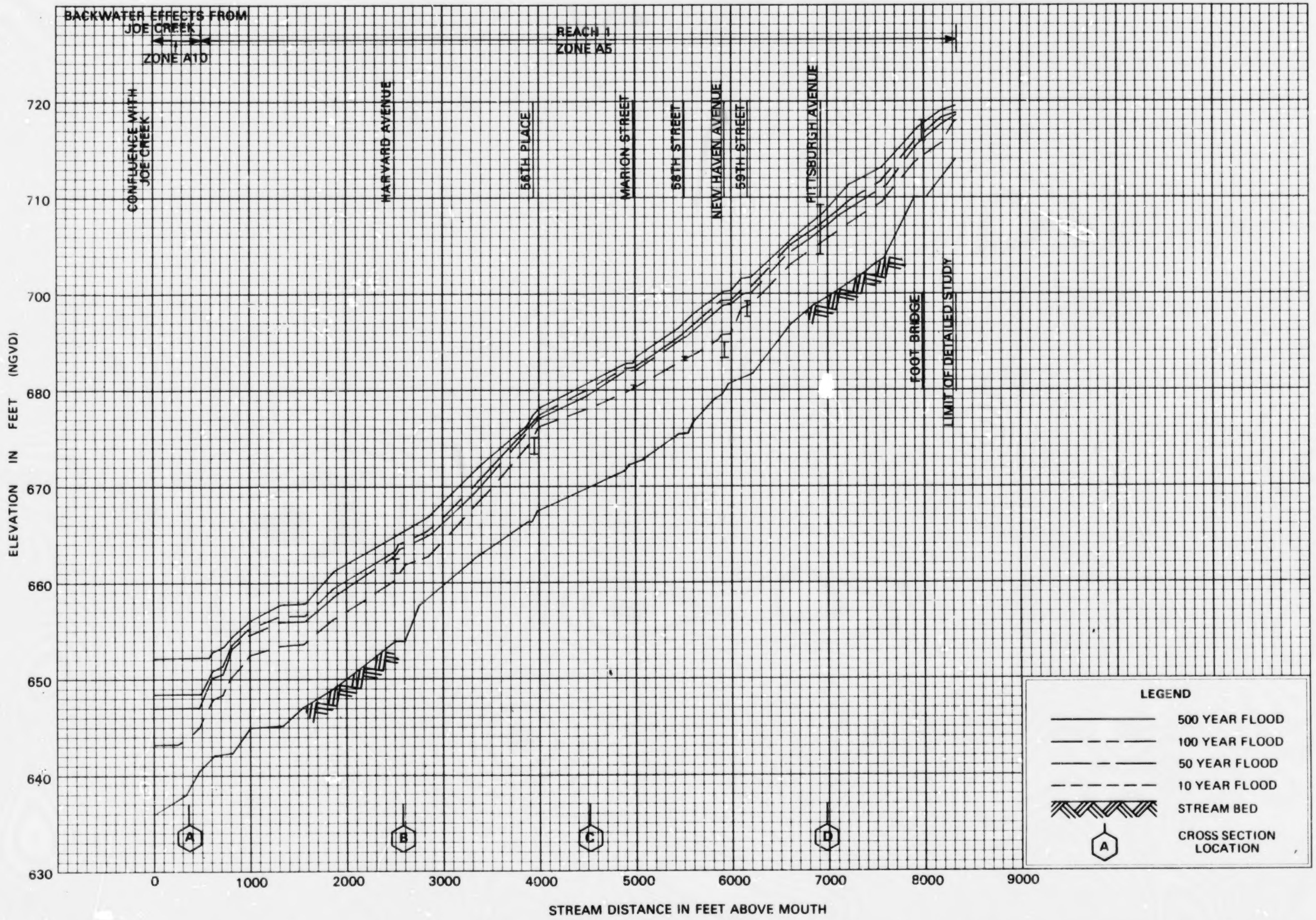
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

70P

165



FLOOD PROFILES

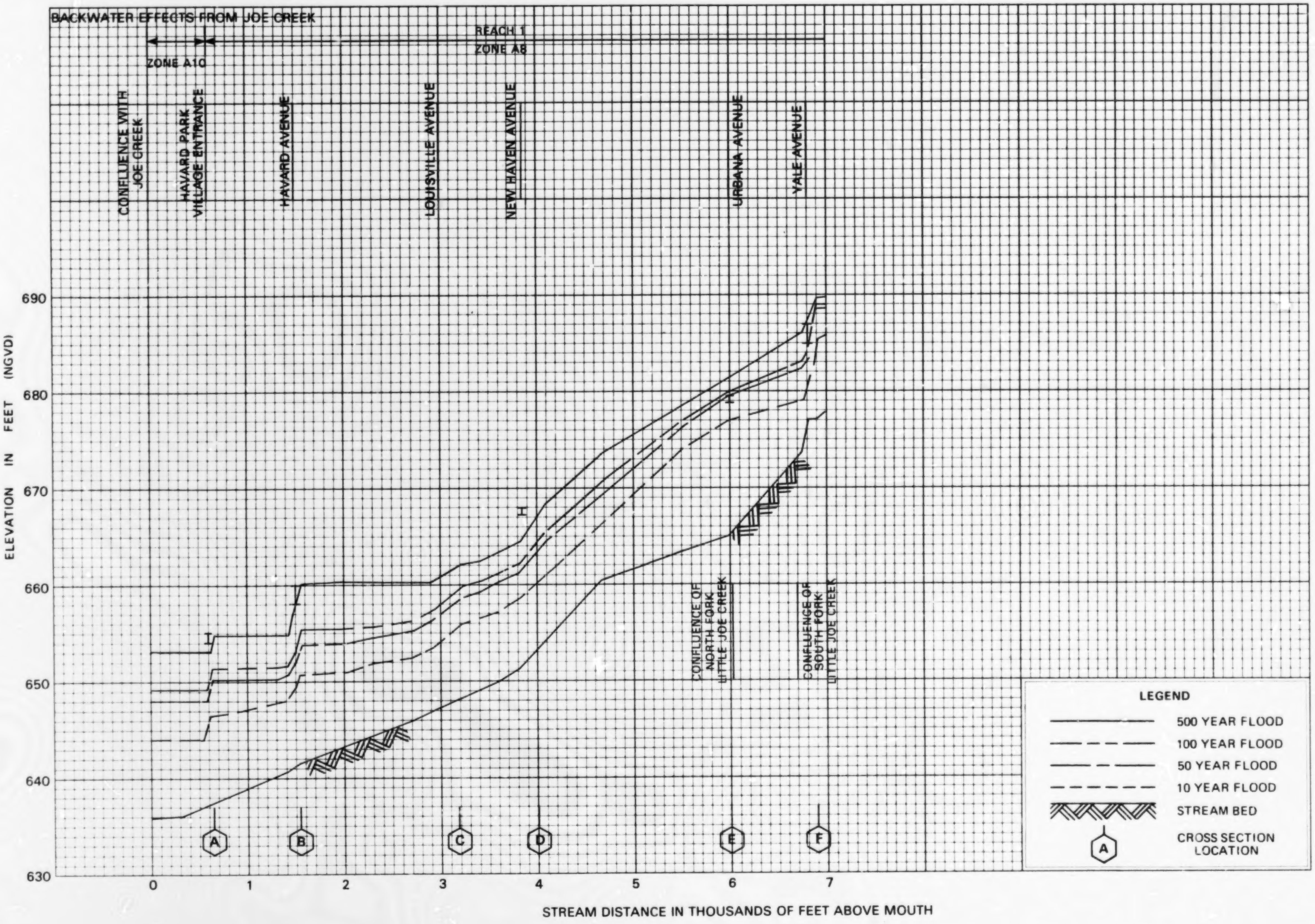
SOUTH FORK JOE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

71P



FLOOD PROFILES

LITTLE JOE CREEK

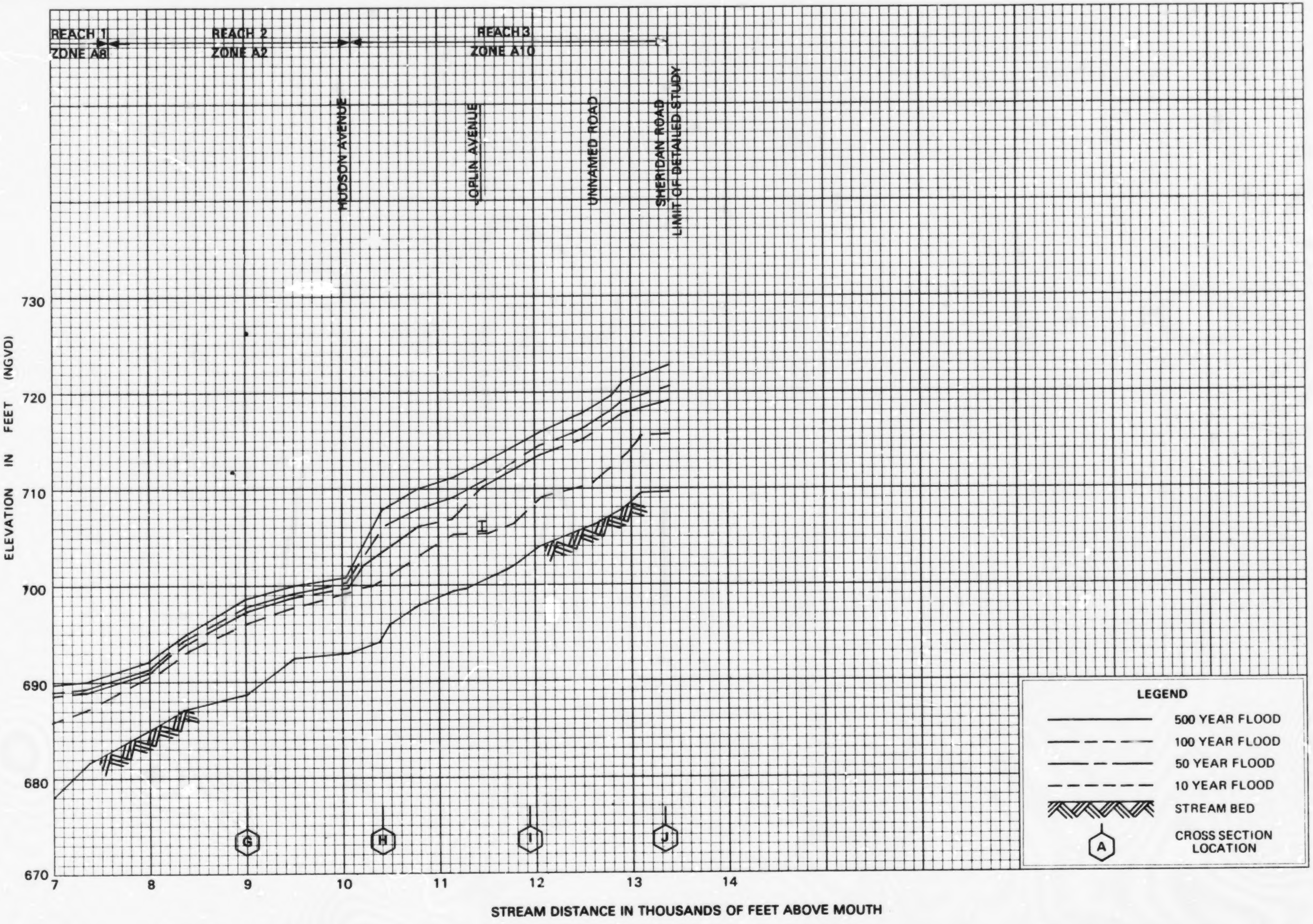
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

72P

BEST COPY AVAILABLE



FLOOD PROFILES

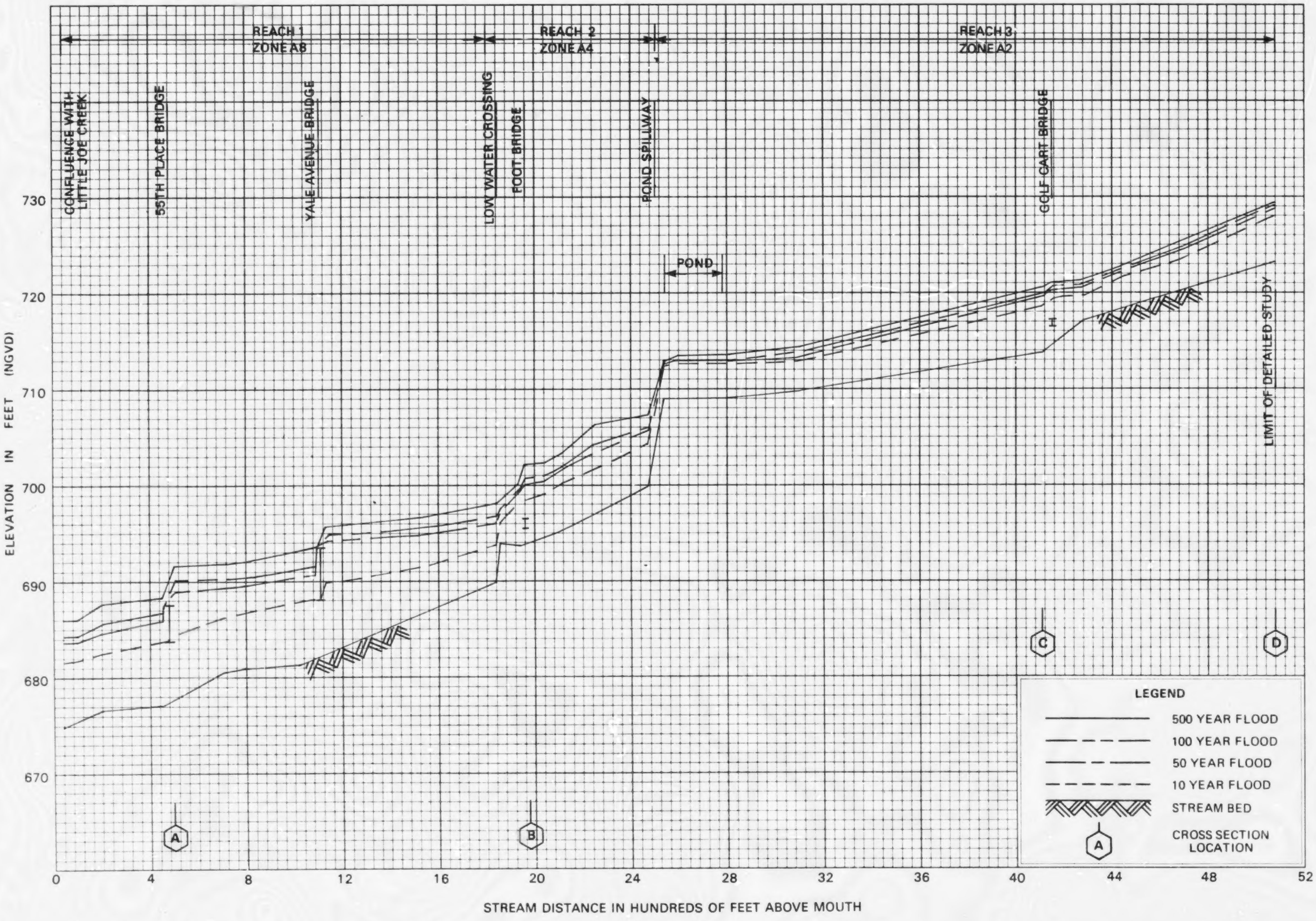
LITTLE JOE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

73P



FLOOD PROFILES

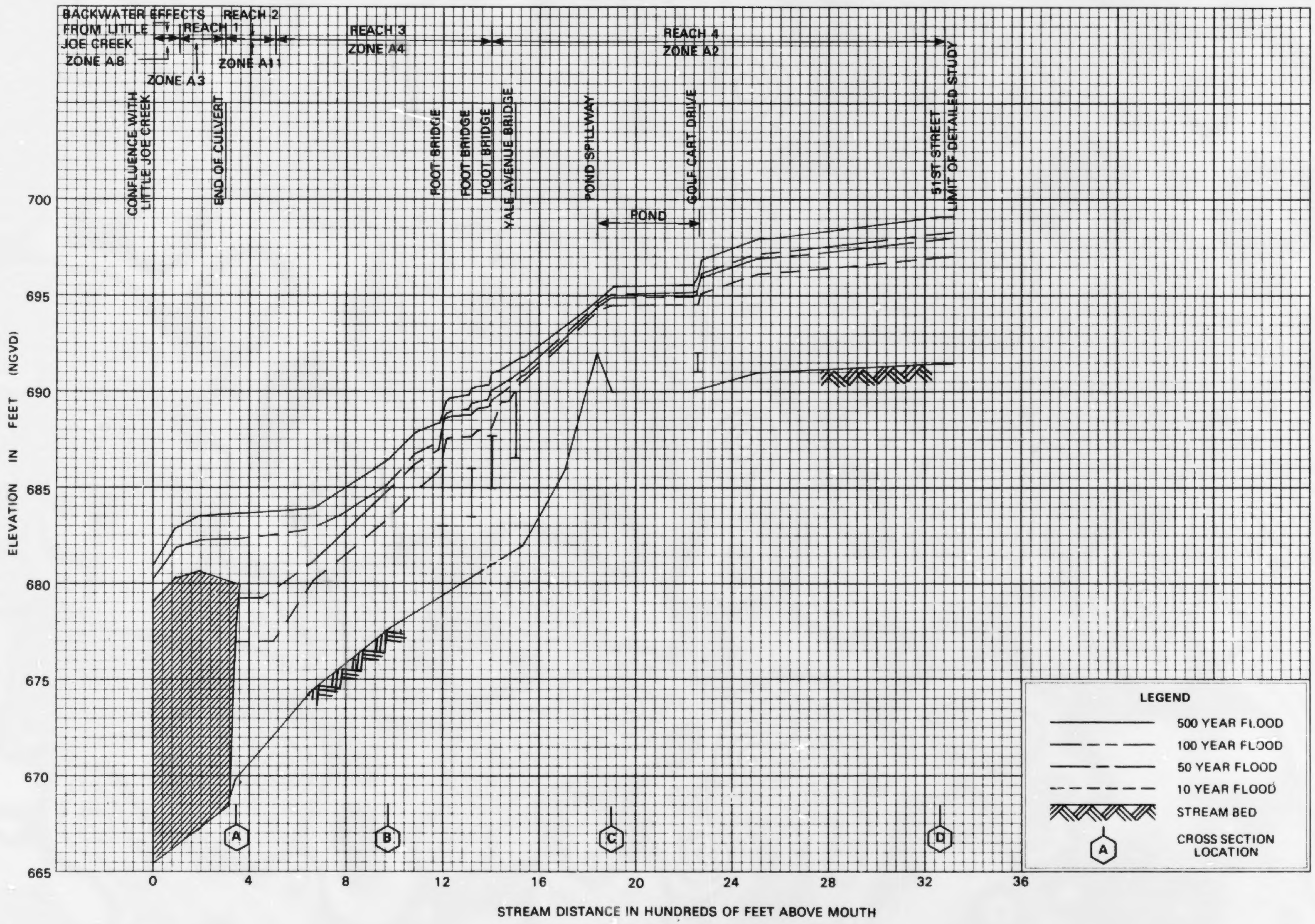
SOUTH FORK LITTLE JOE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

74P

169



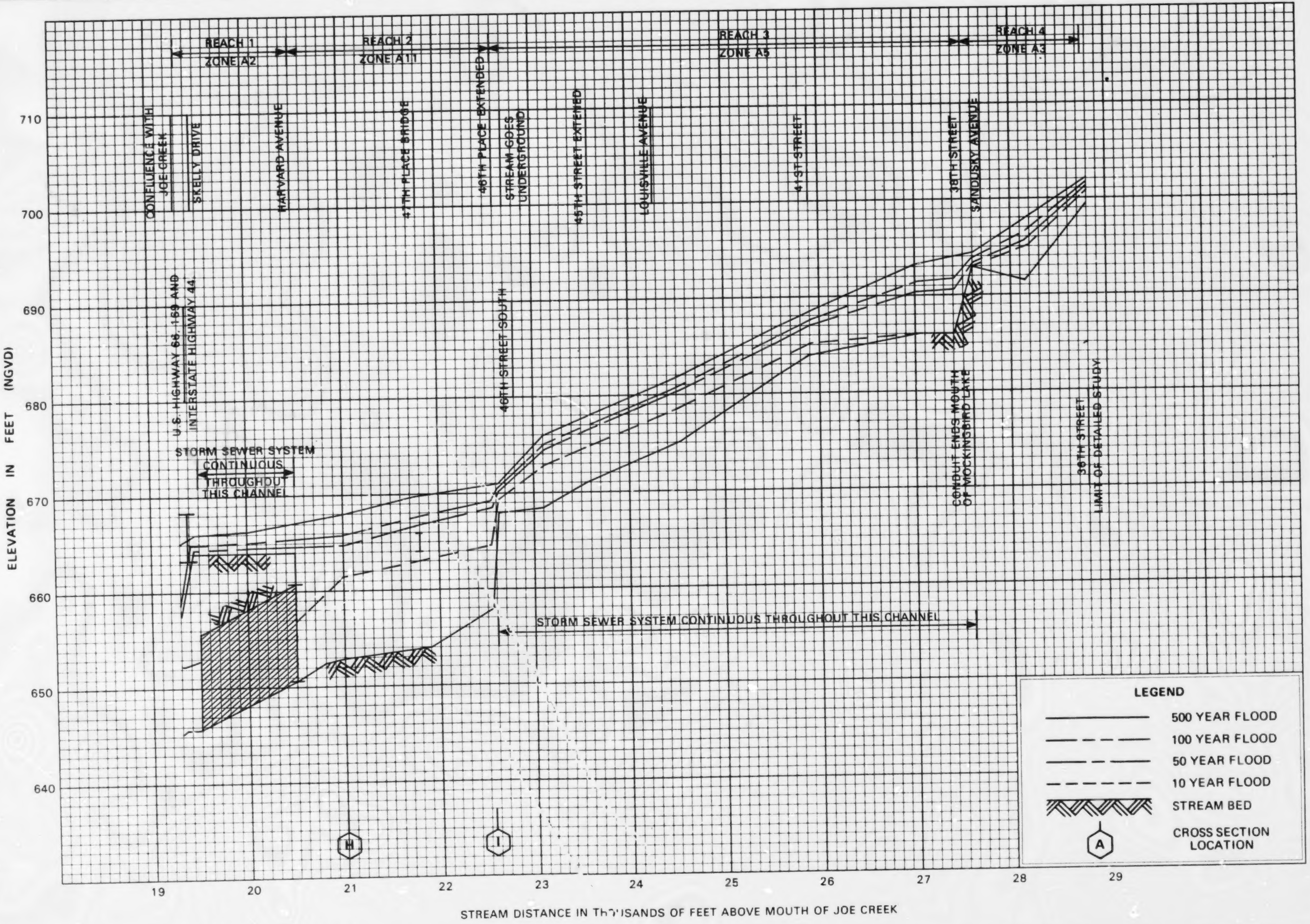
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

FLOOD PROFILES

NORTH FORK LITTLE JOE CREEK

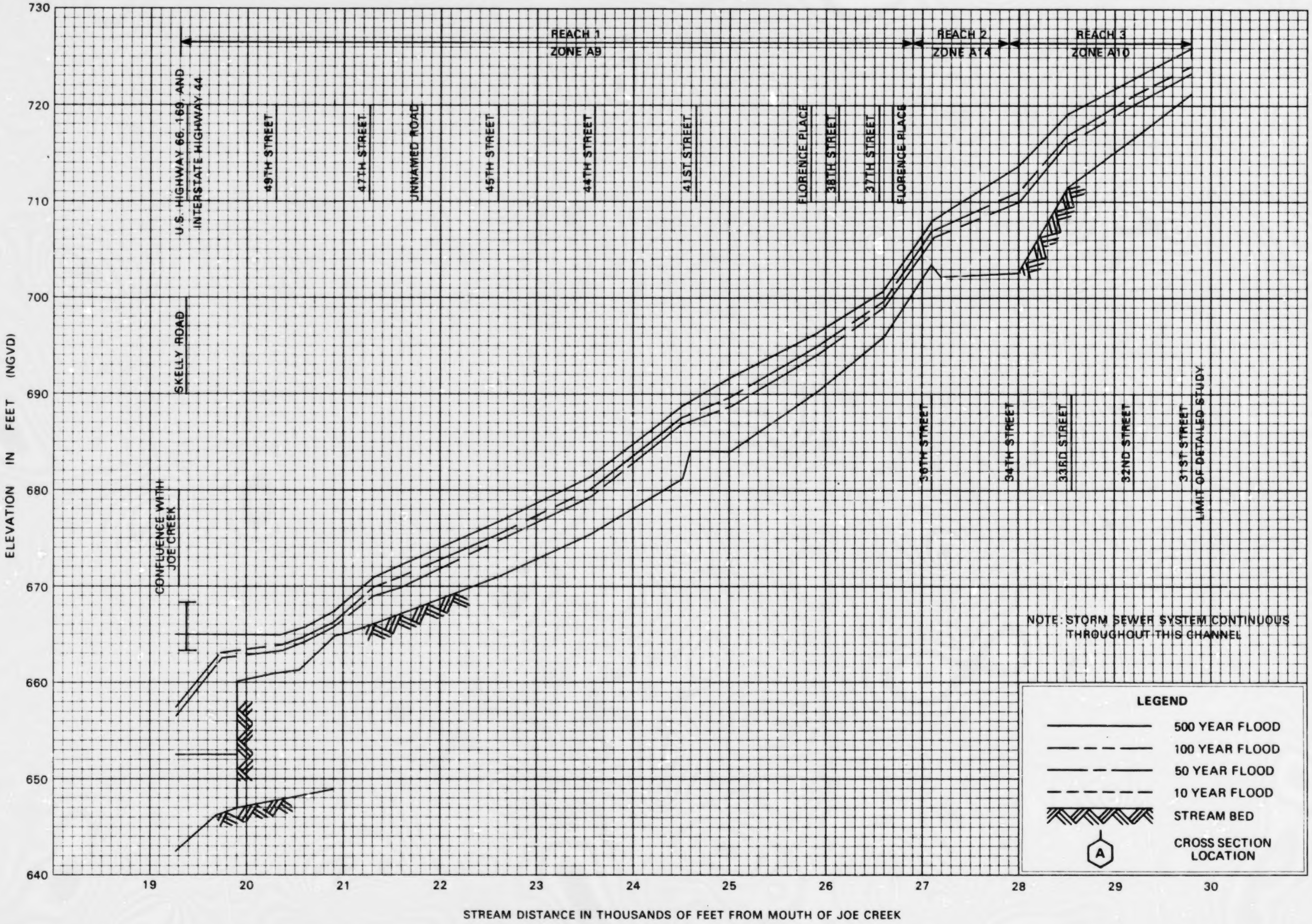


FLOOD PROFILES

EAST BRANCH JOE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

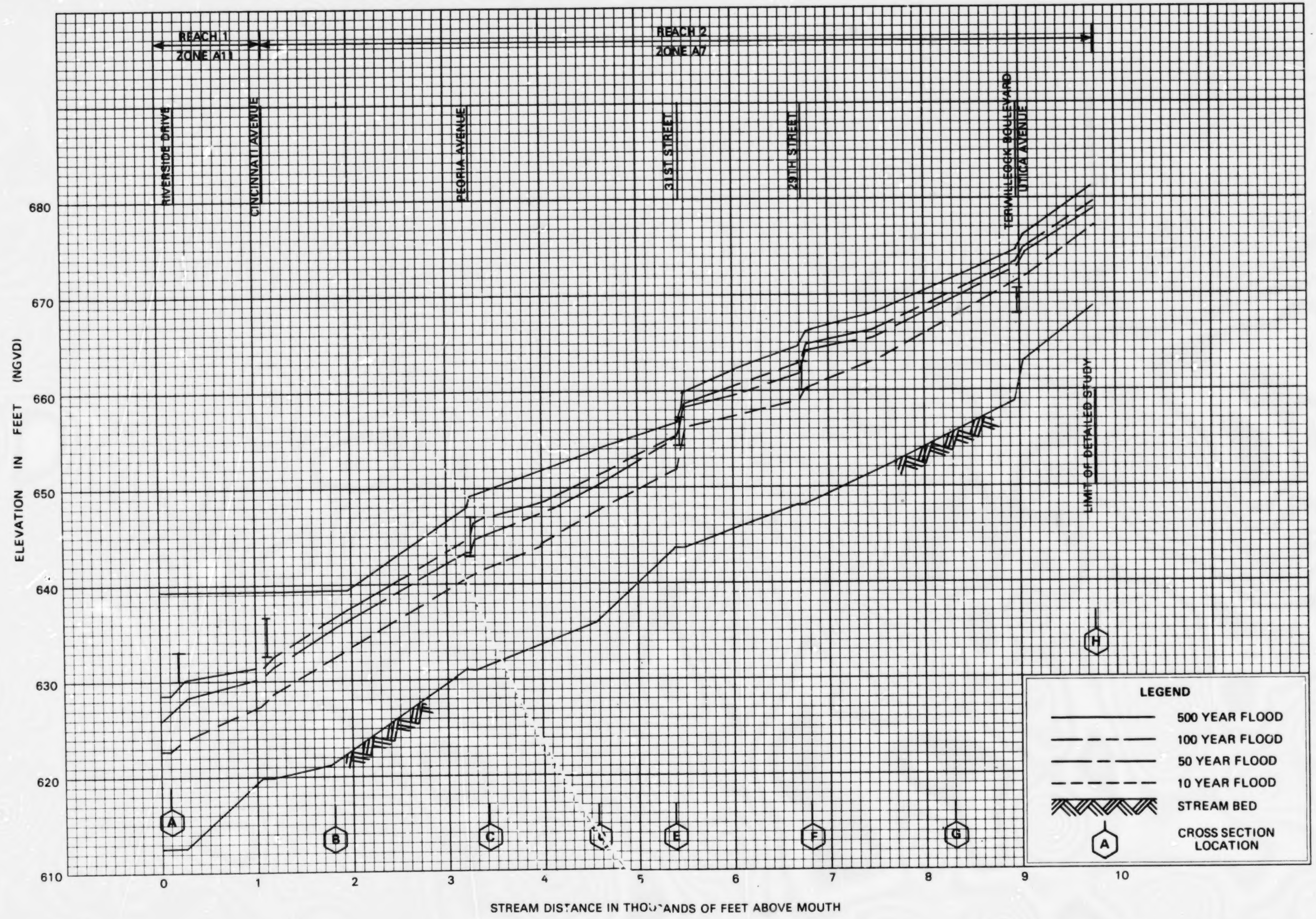


FLOOD PROFILES

WEST BRANCH JOE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)



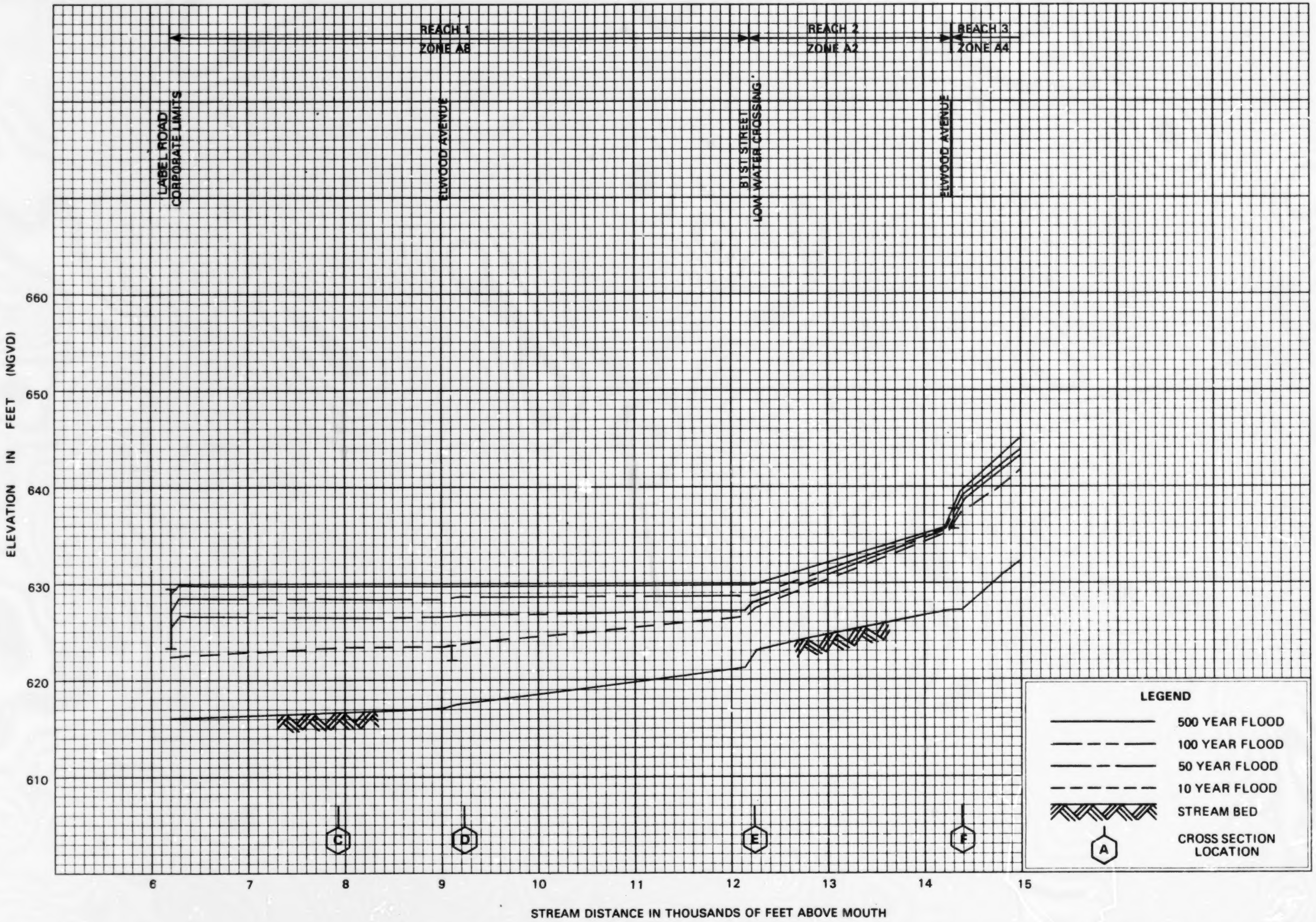
FLOOD PROFILES

CROW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

78P



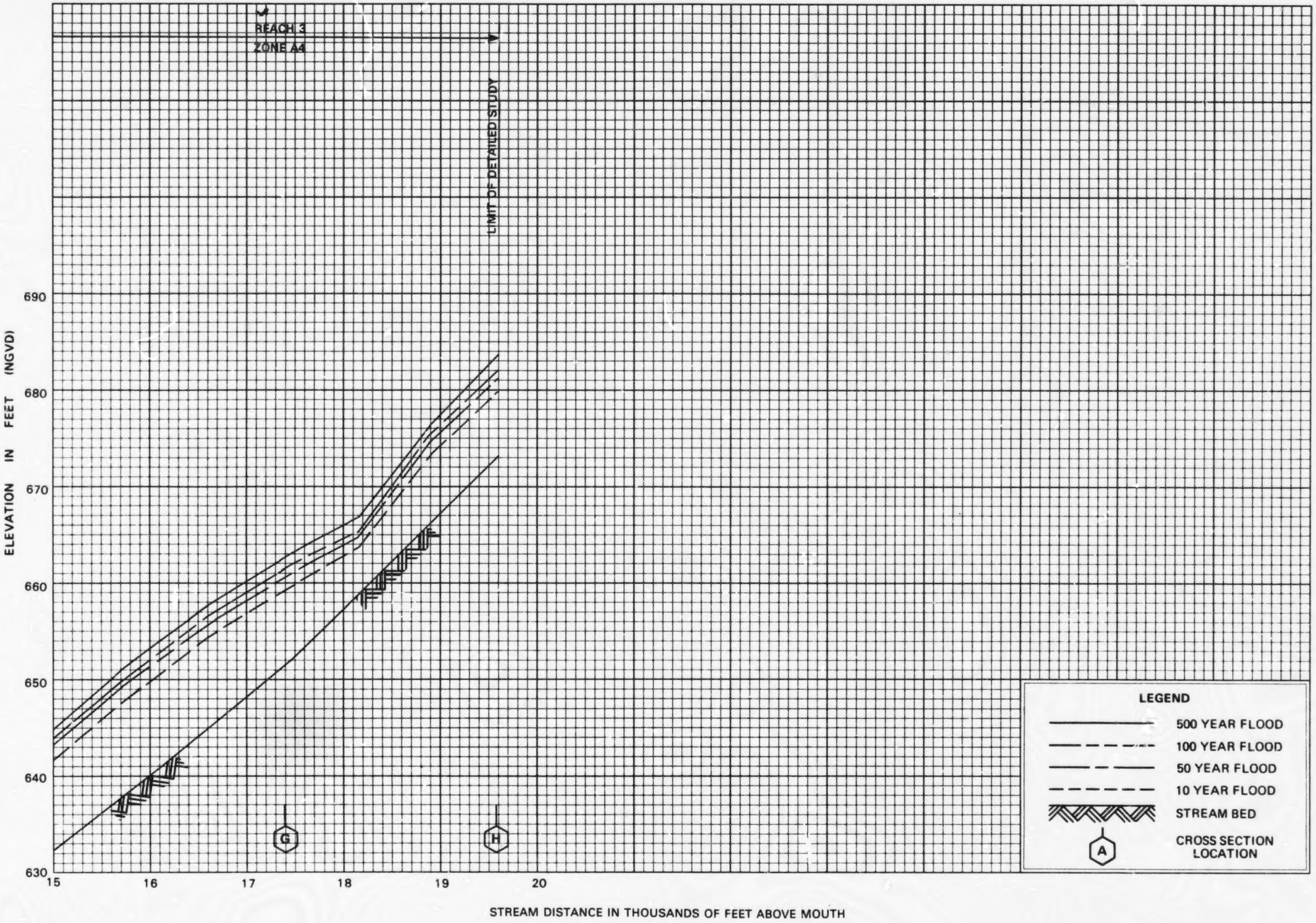
FLOOD PROFILES

HAGER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)



FLOOD PROFILES

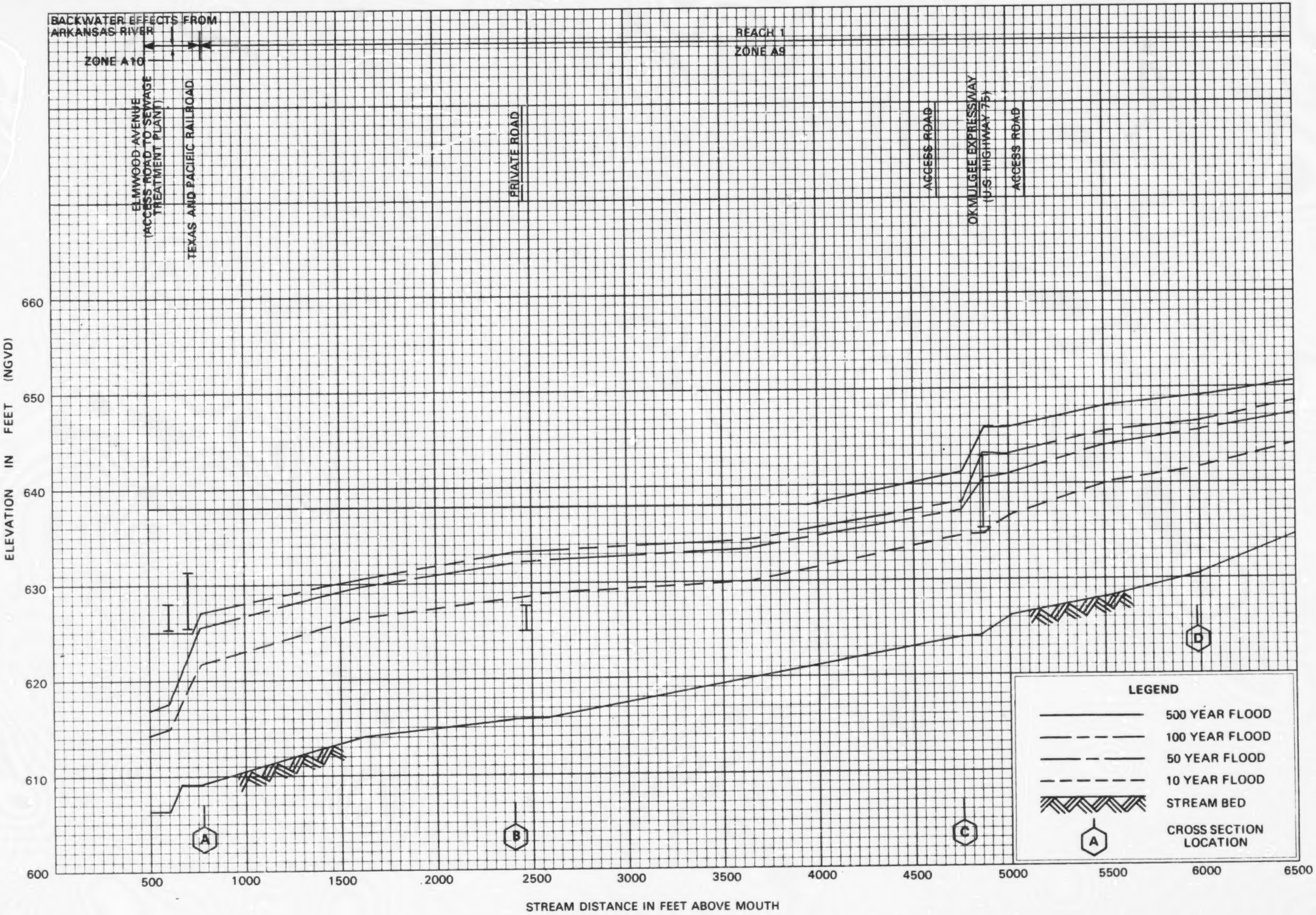
HAGER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

80P



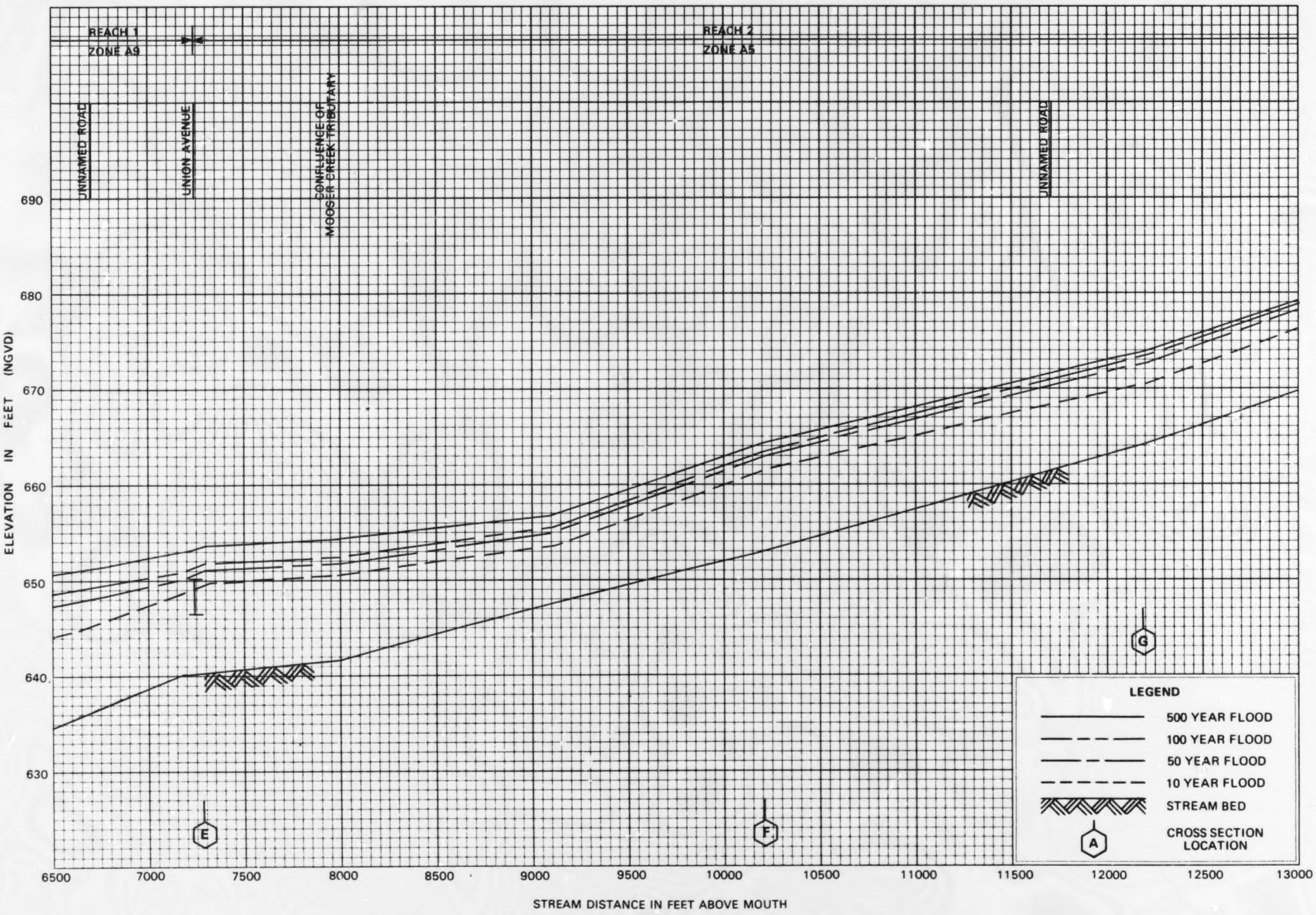
FLOOD PROFILES

MOOSER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)



FLOOD PROFILES

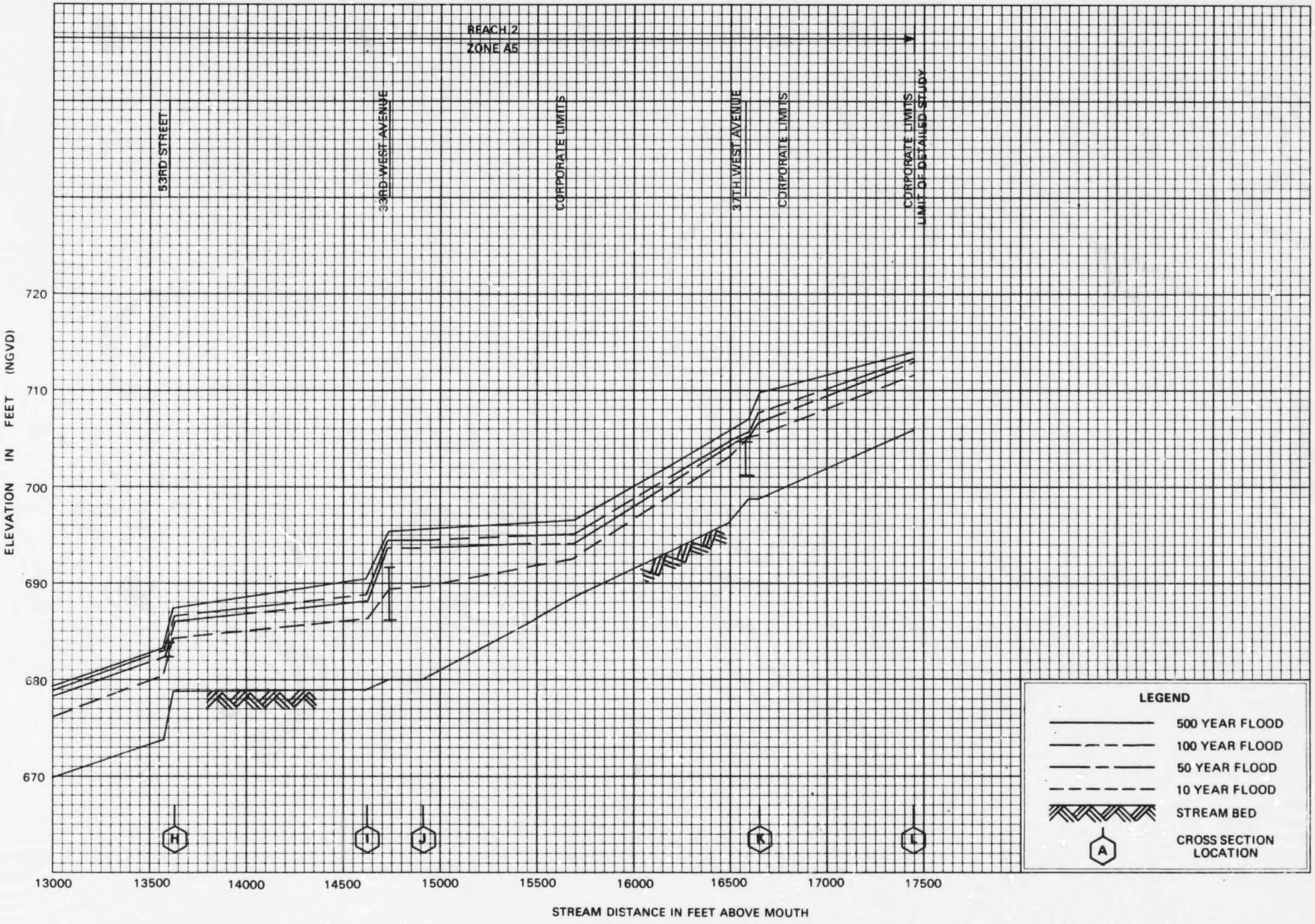
MOOSER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

82P



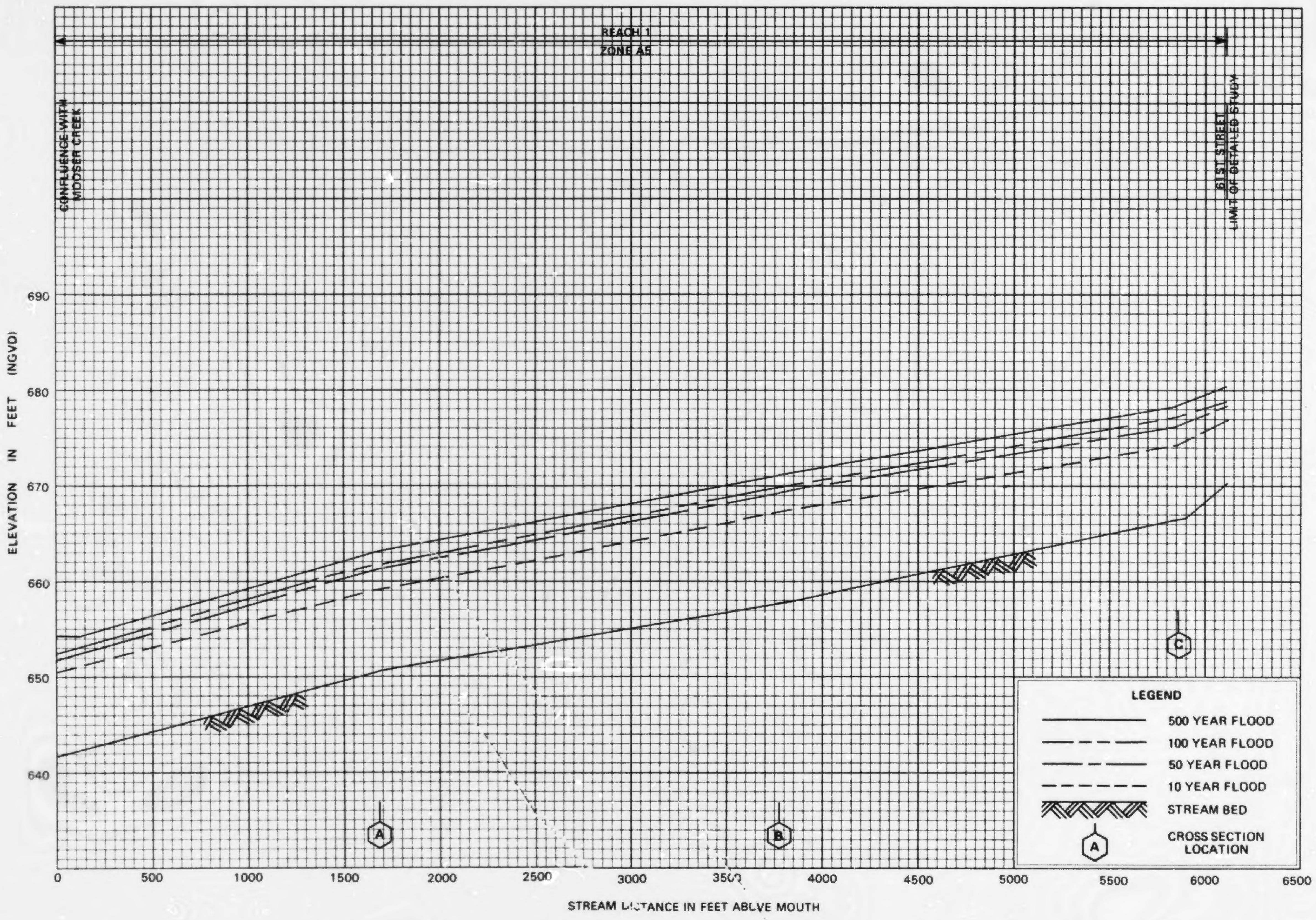
FLOOD PROFILES

MOOSER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)



FLOOD PROFILES

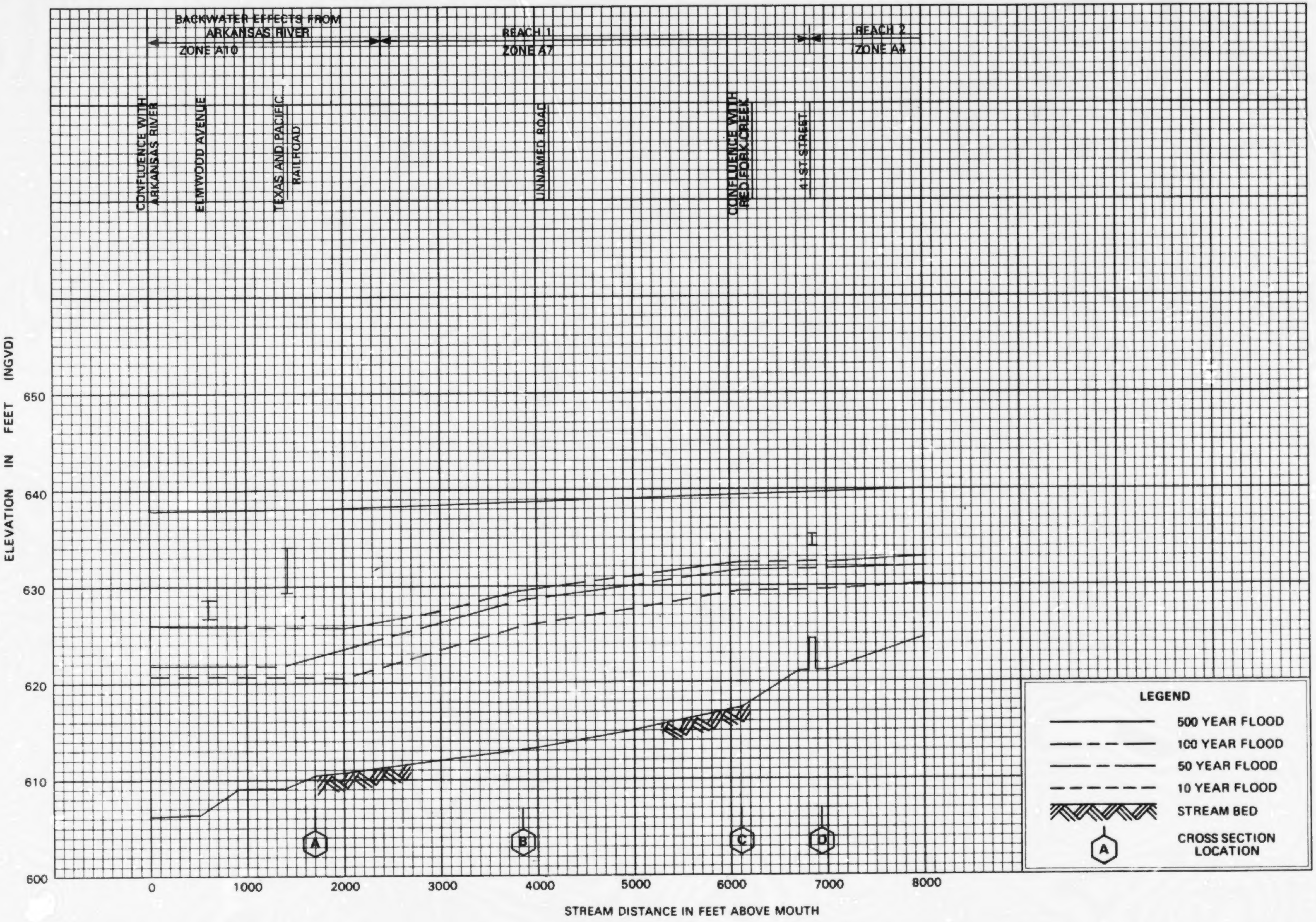
MOOSER CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

84P



FLOOD PROFILES

CHERRY CREEK (WEST TULSA)

FEDERAL EMERGENCY MANAGEMENT AGENCY

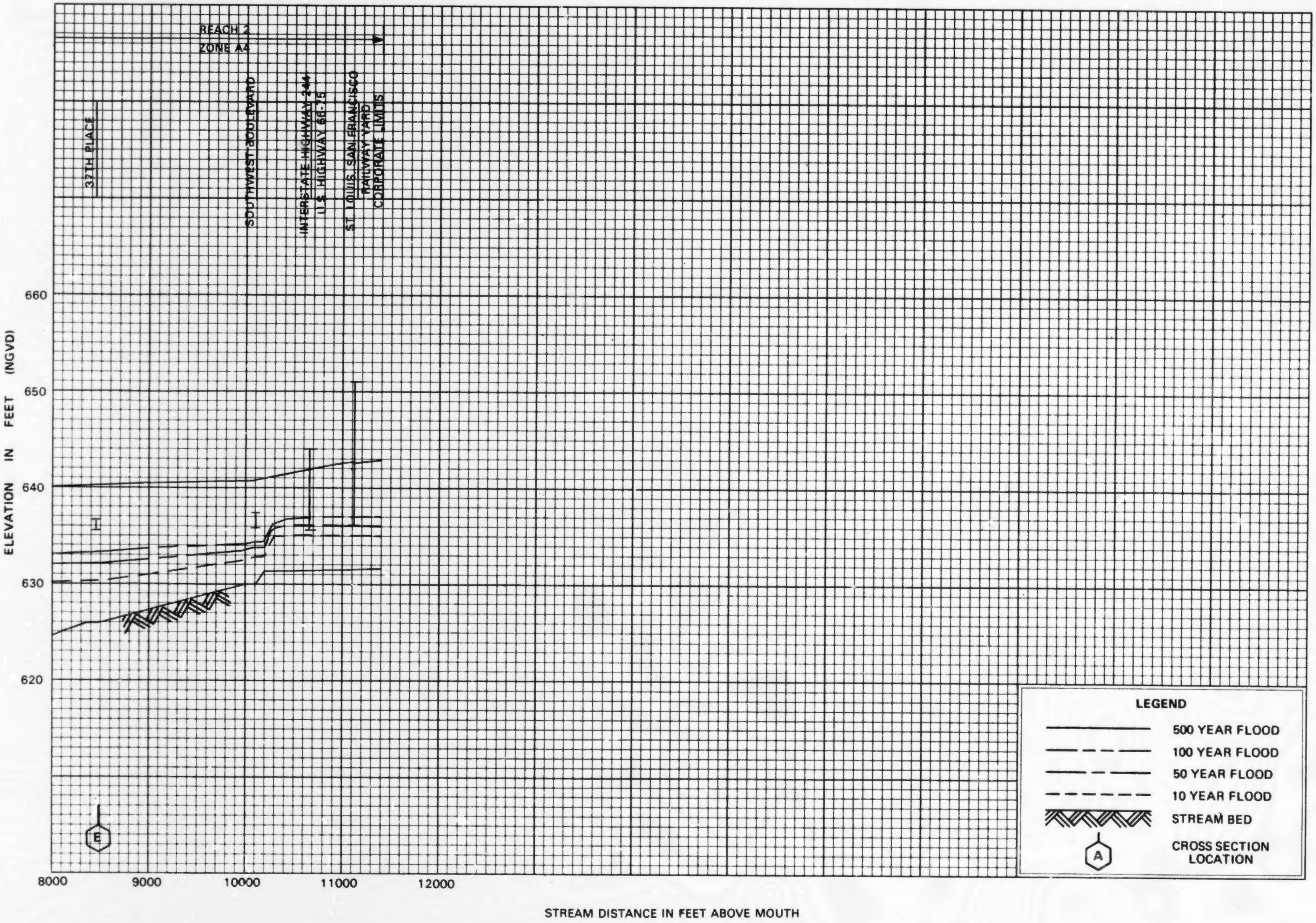
CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

85P

180

FLOOD PROFILES

CHERRY CREEK (WEST TULSA)

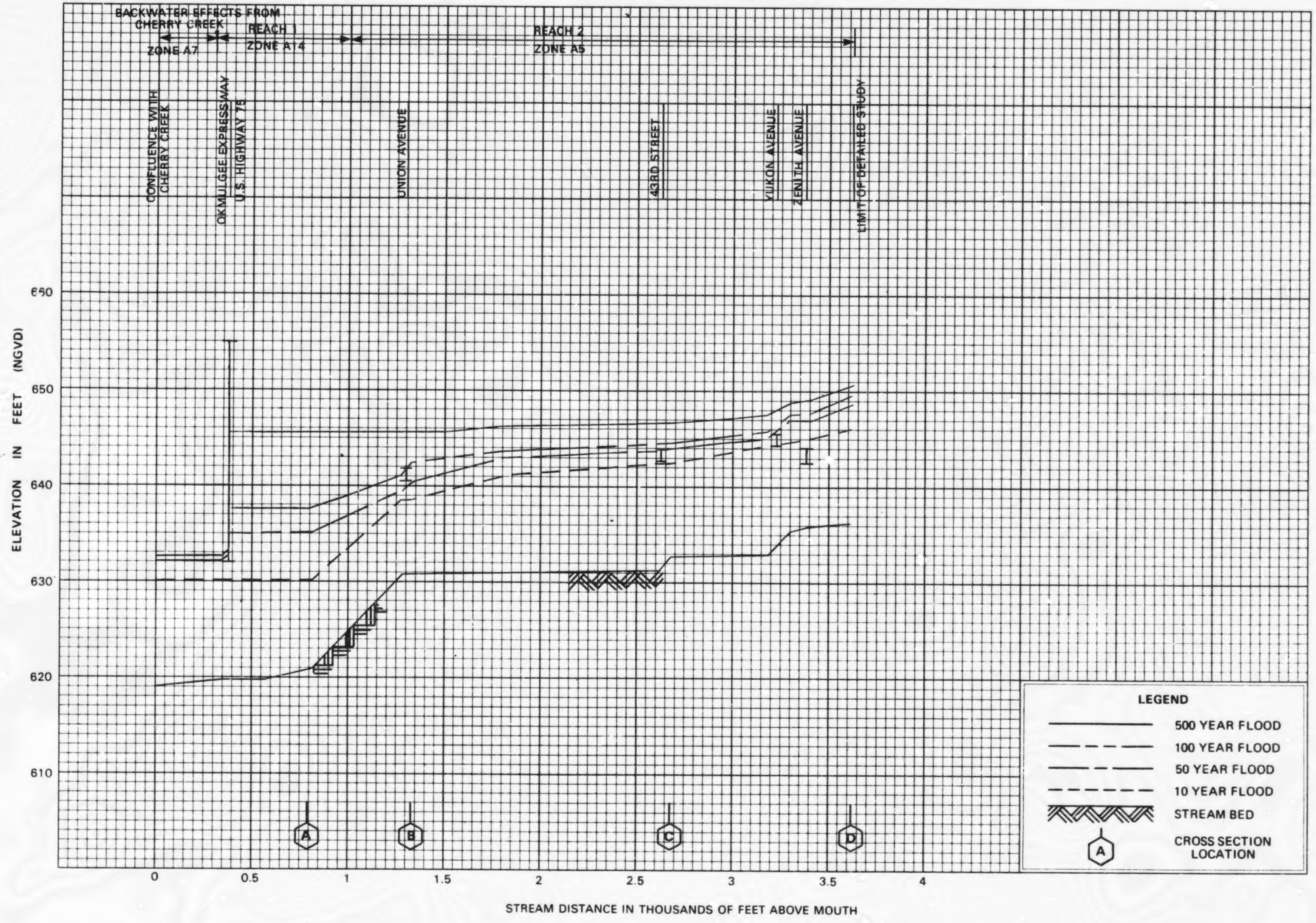


FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

86P



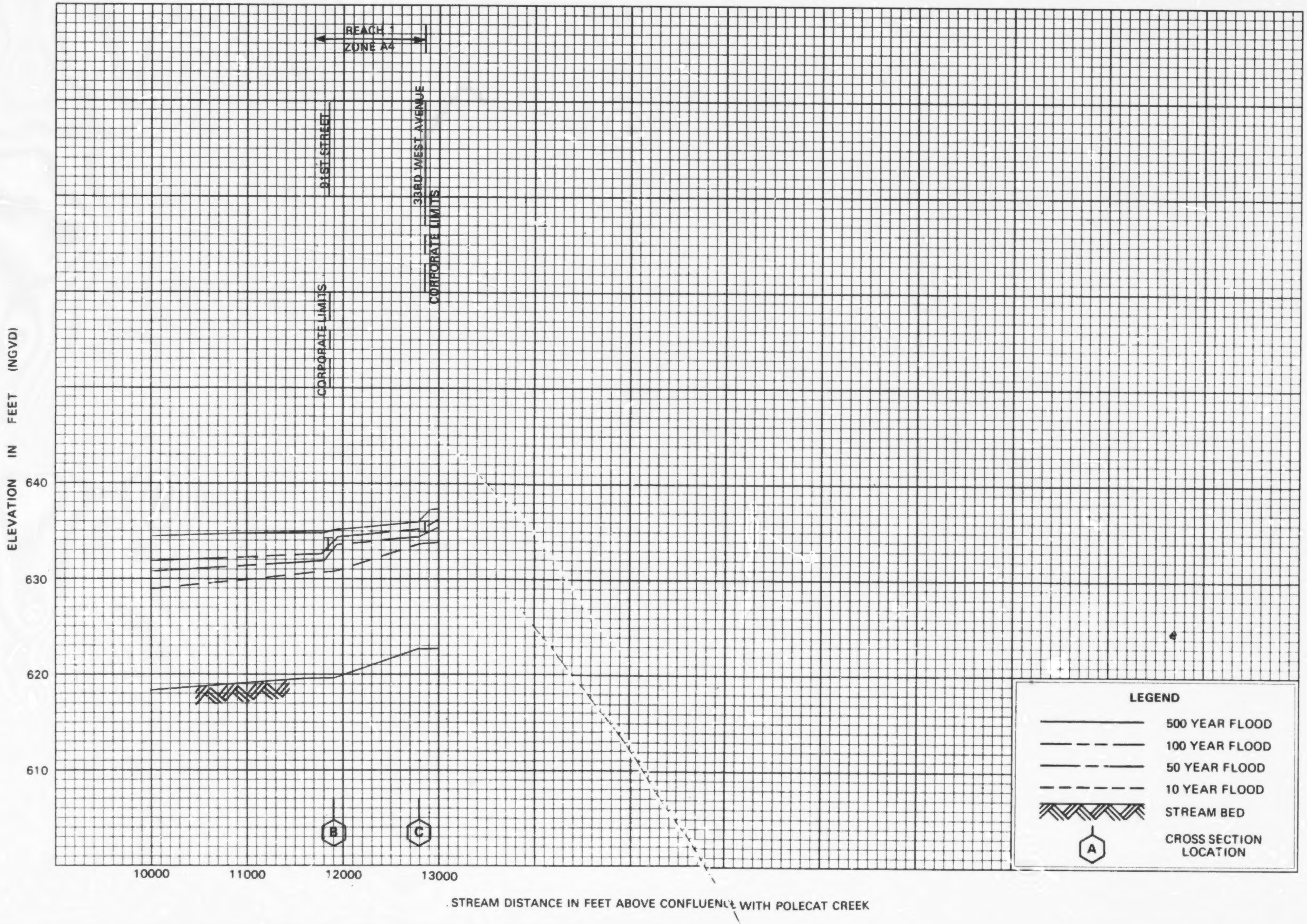
FLOOD PROFILES

RED FORK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

87P



FLOOD PROFILES

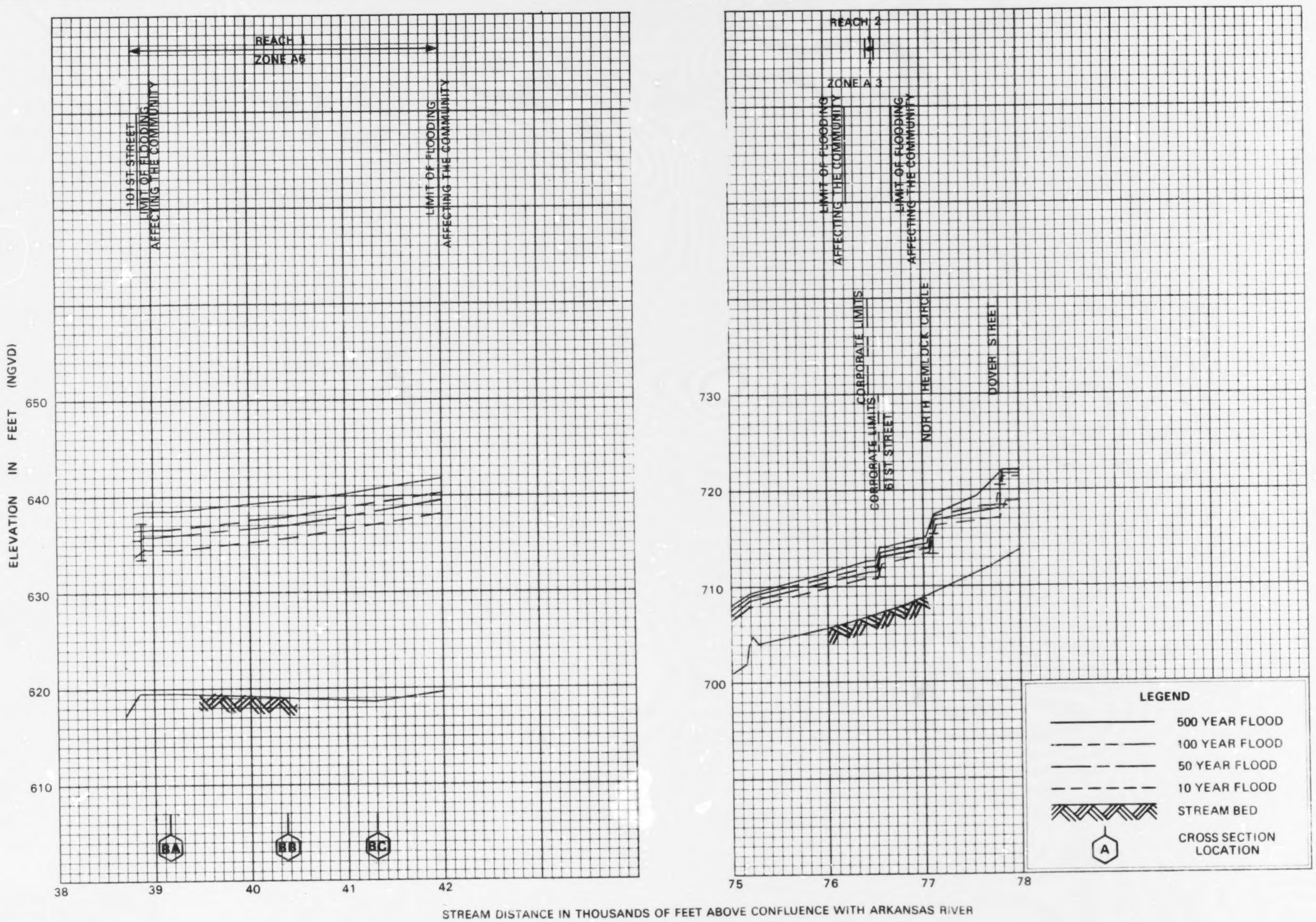
NICKEL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

88P



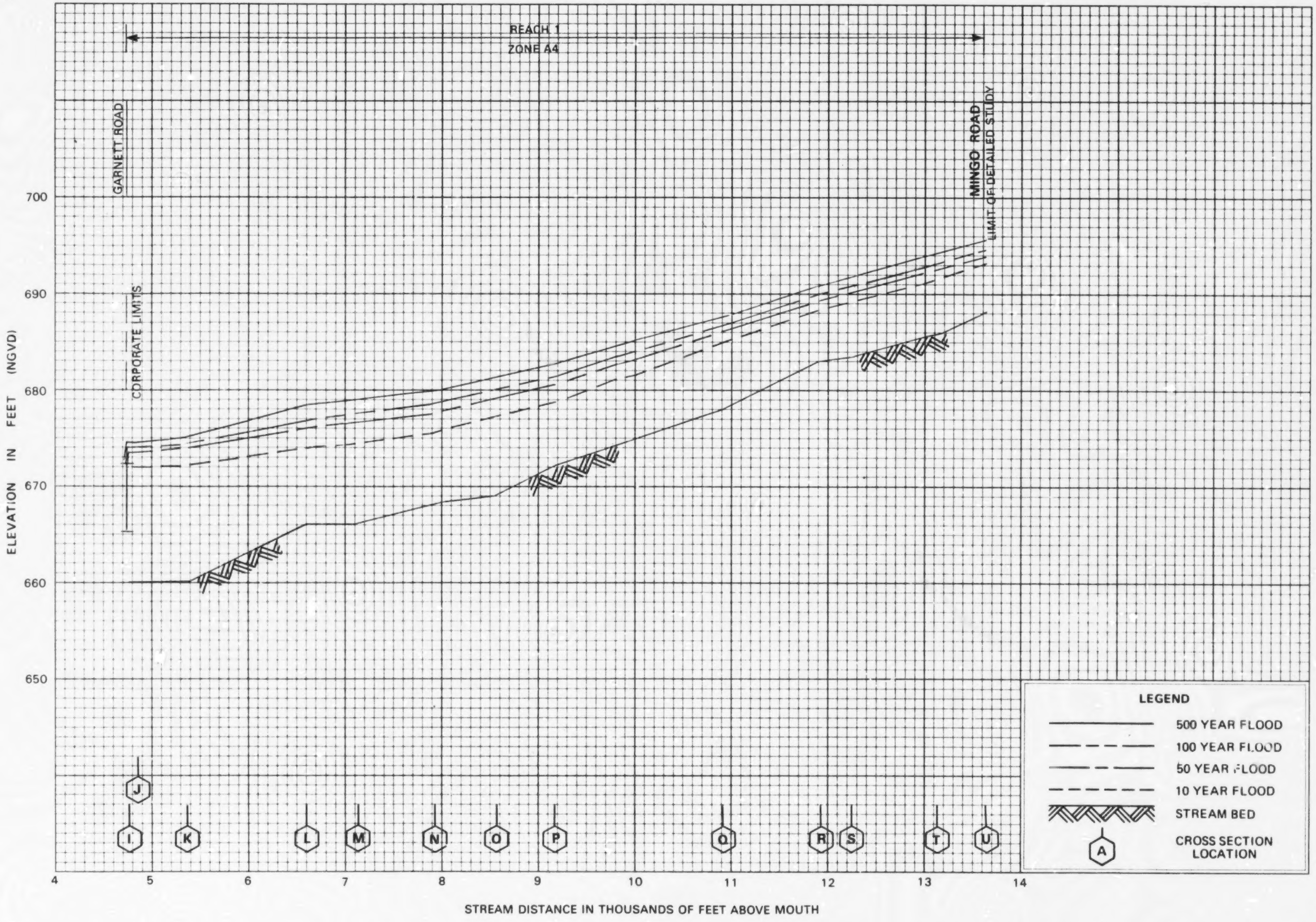
FLOOD PROFILES

HAIKEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

194



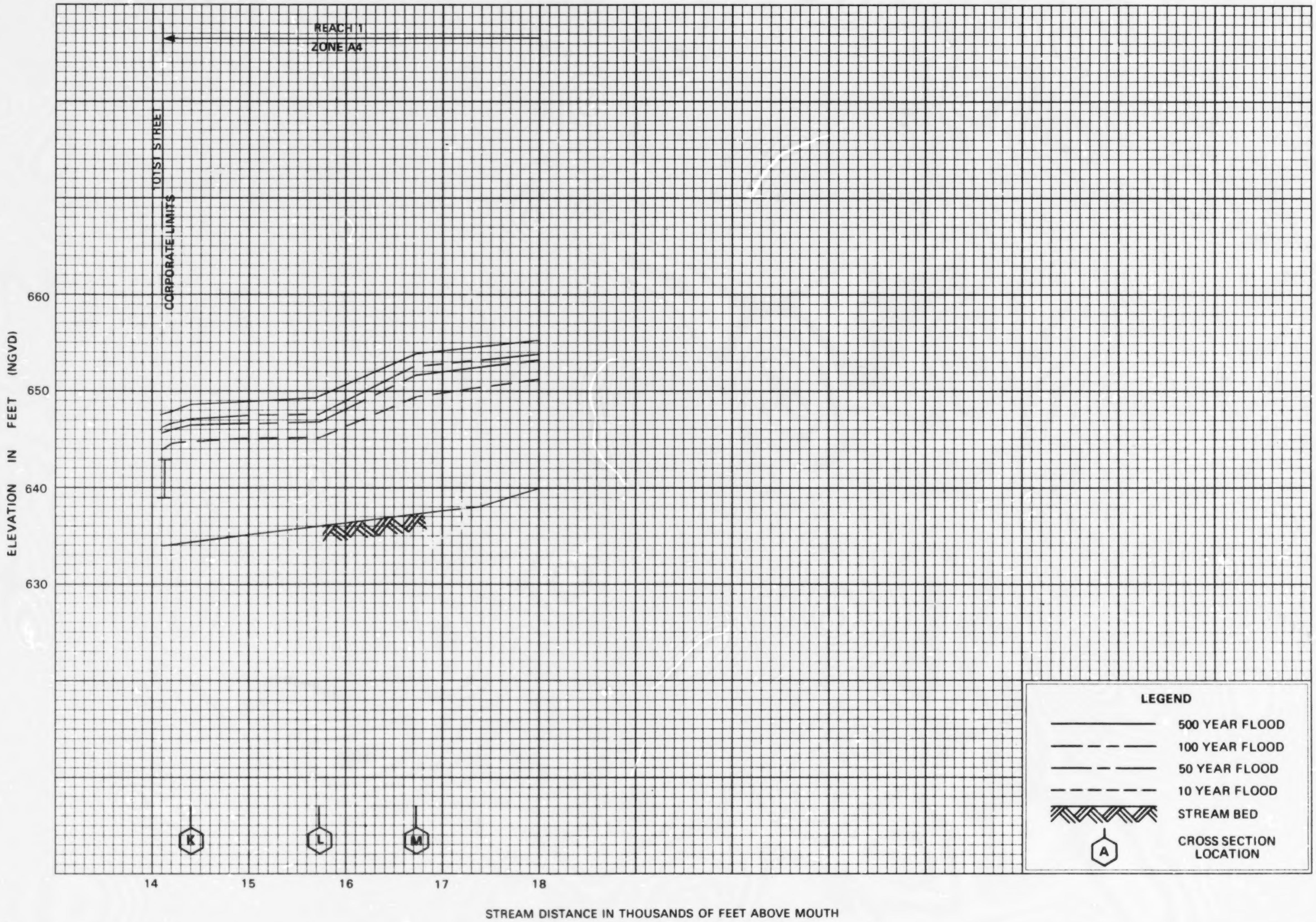
FLOOD PROFILES

WEST BRANCH HAIKEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)



FLOOD PROFILES

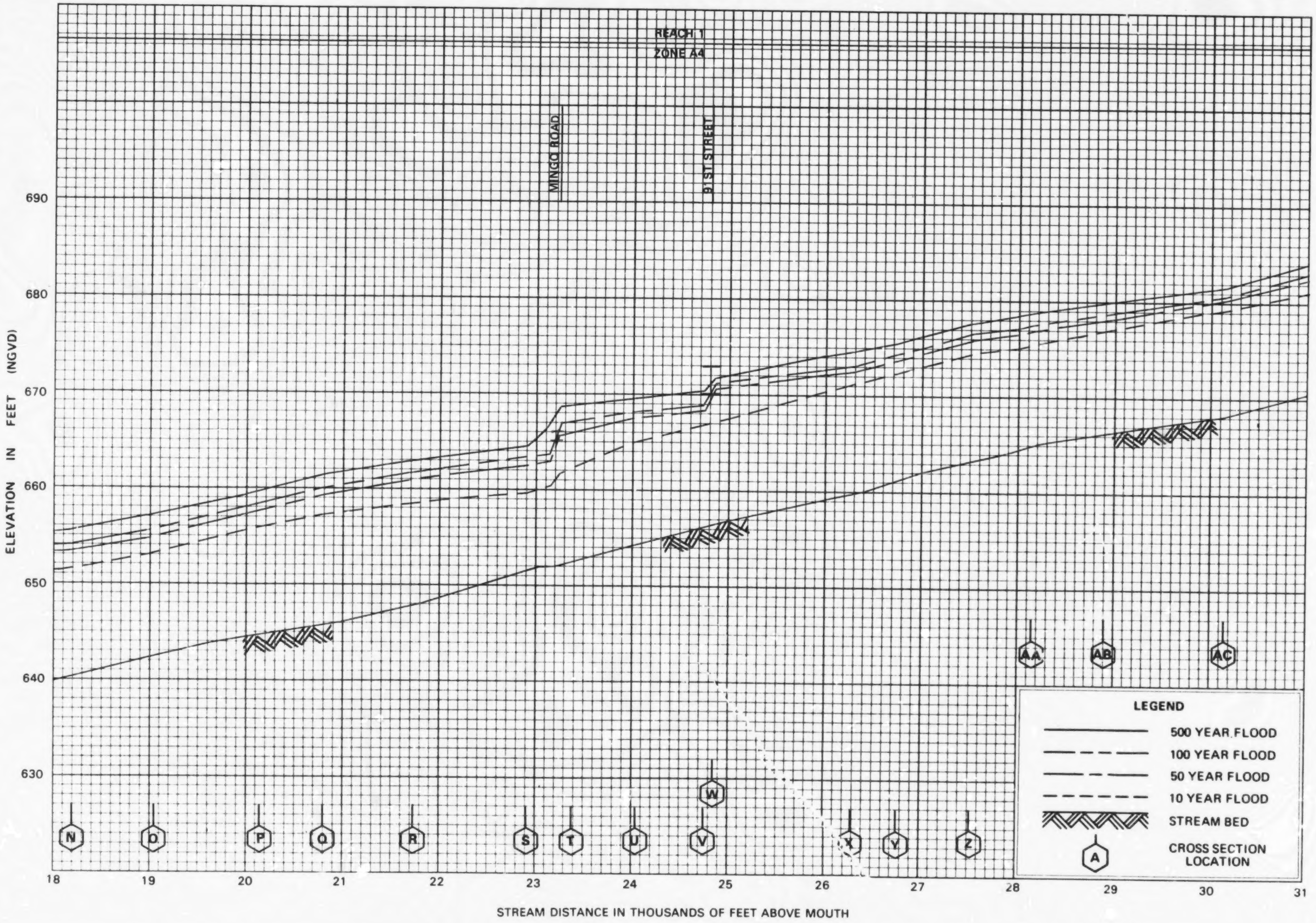
LITTLE HAIKEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

91P



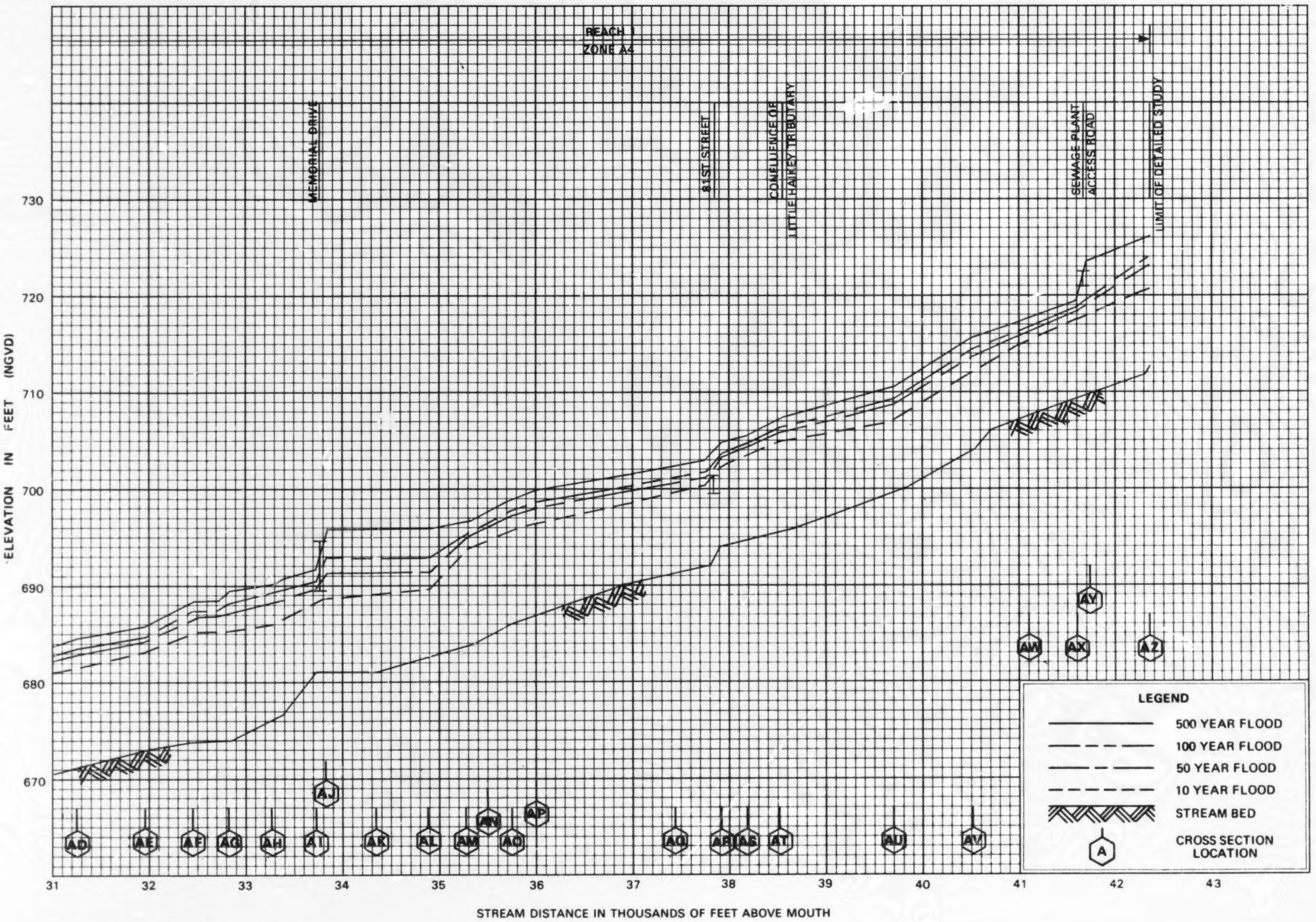
FLOOD PROFILES

LITTLE HAIKEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

92P



FLOOD PROFILES

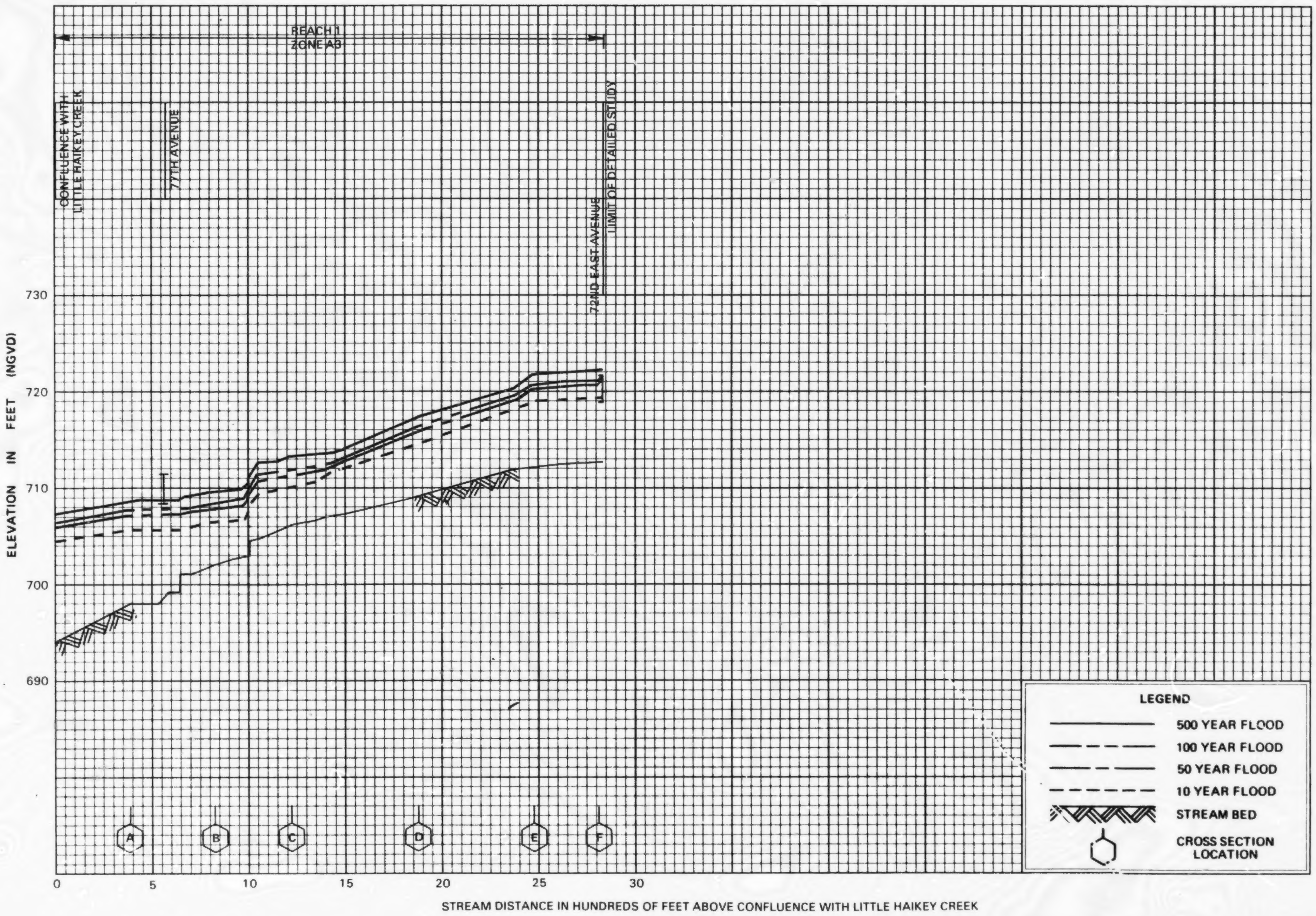
LITTLE HAIKEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

93P

188



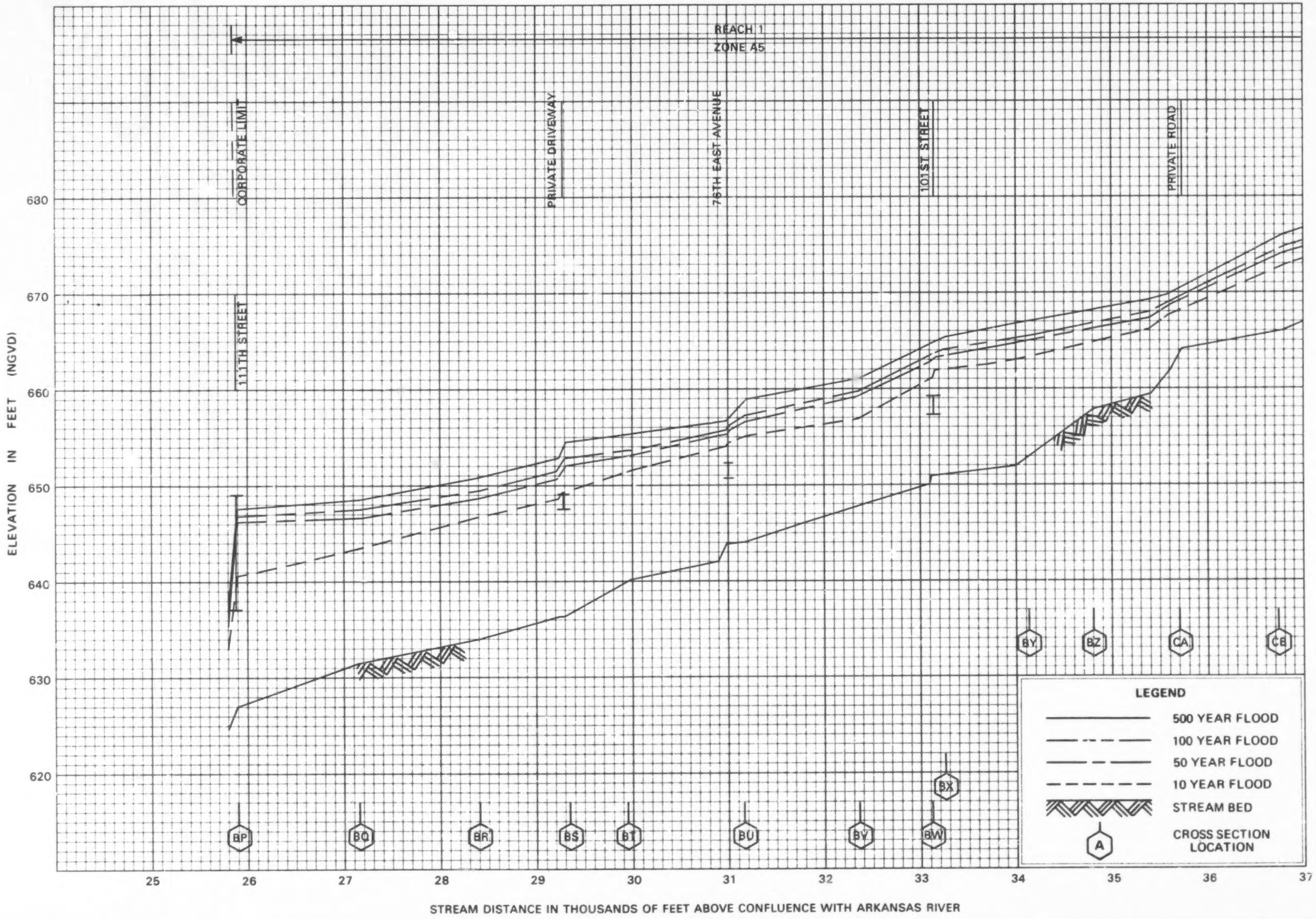
FLOOD PROFILES

LITTLE HAIKEY CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS CO.)



FLOOD PROFILES

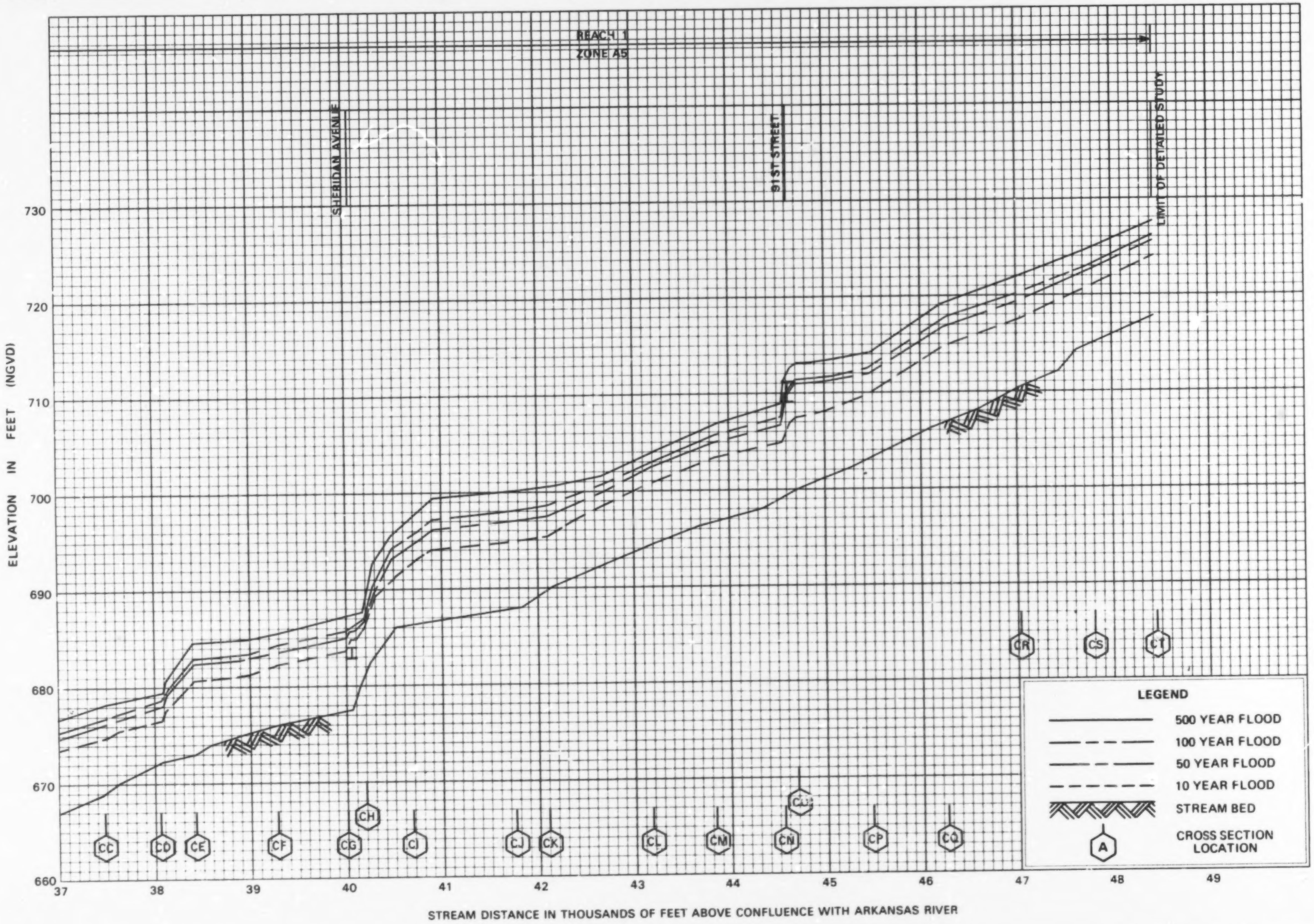
FRY DITCH NO. 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

95P



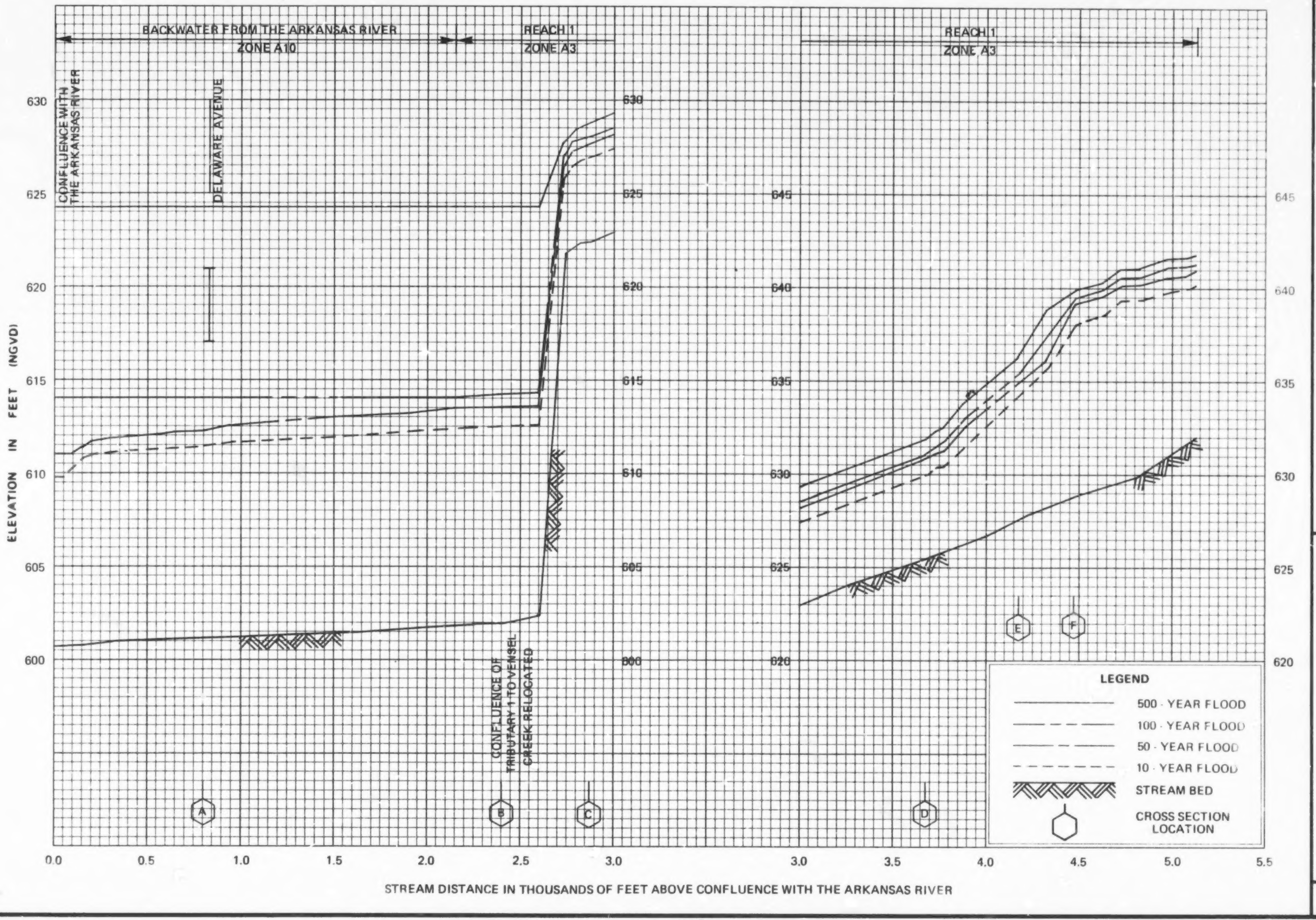
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK
(TULSA, OSAGE, AND ROGERS COS.)

FLOOD PROFILES

FRY DITCH NO. 2

96P



FLOOD PROFILES

VENSEL CREEK RELOCATED

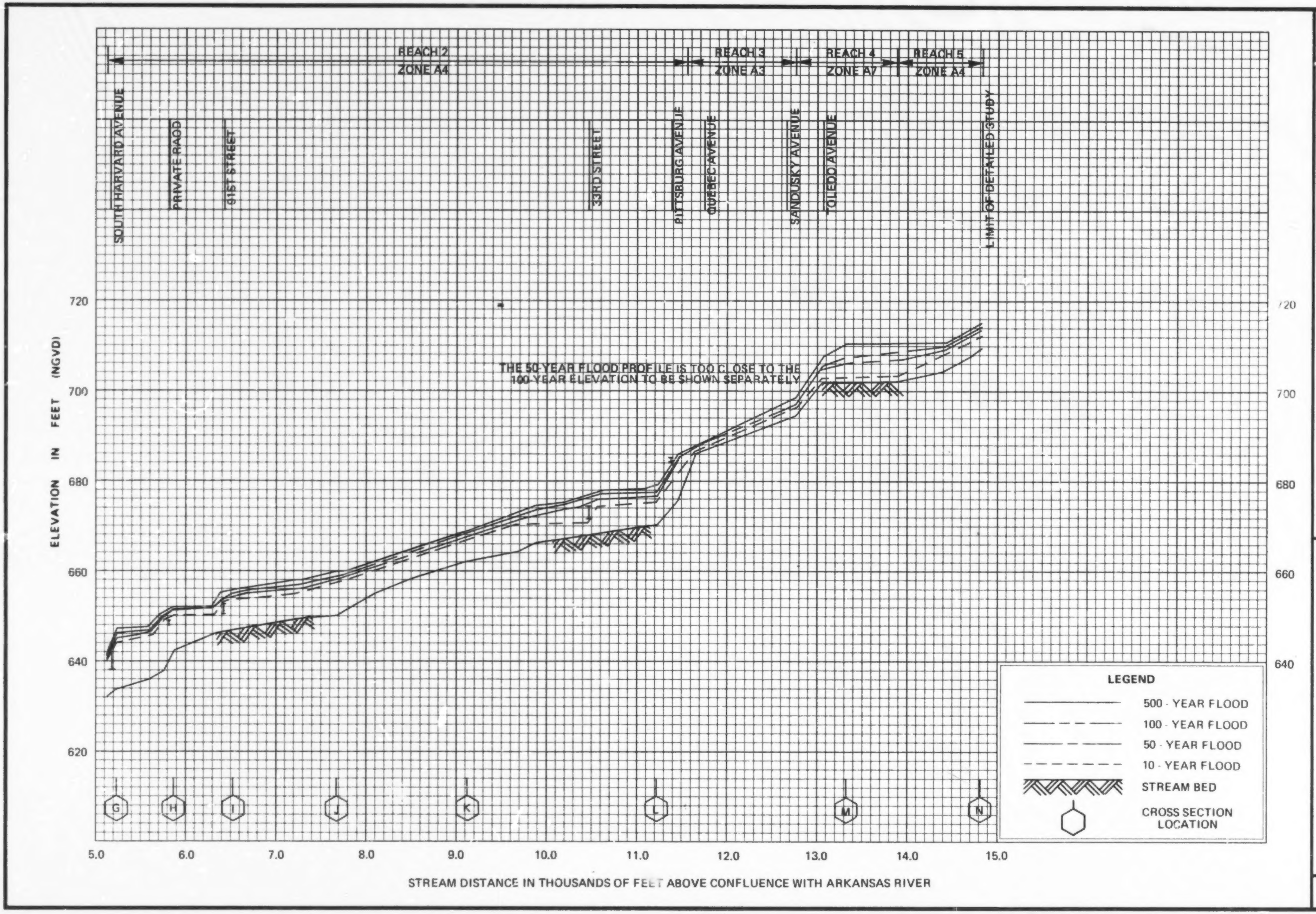
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

97P

192



FLOOD PROFILES

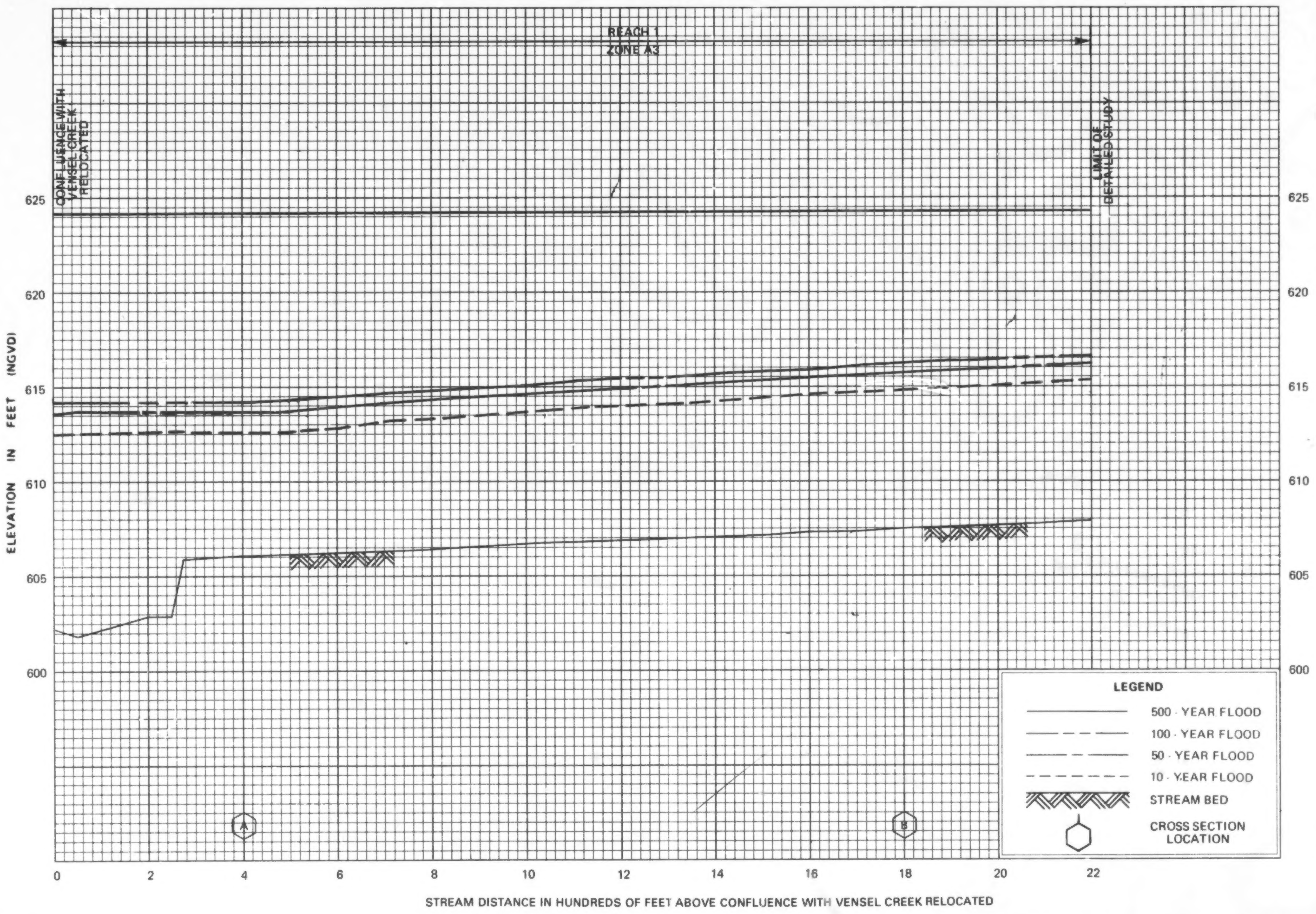
VENSEL CREEK RELOCATED

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

98P



FLOOD PROFILES

TRIBUTARY 1 TO VENSEL CREEK RELOCATED

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TULSA, OK

(TULSA, OSAGE, AND ROGERS COS.)

99P